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THIRTEENTH ANNUAL REPORT

OF THE

SECRETARY

OF THE

STATE BOARD OF HEALTH,

OF THE

STATE OF MICHIGAN,

FOR THE

FISCAL YEAR ENDING SEPT. 30, 1885.

MICHIGAN STATE BOARD OF HEALTH
SEAL.

BY AUTHORITY.

LANSING:
THORP & GODFREY, STATE PRINTERS AND BINDERS.
1886.

STATE BOARD OF HEALTH.
OFFICE OF THE SECRETARY,
Lansing, Michigan, December, 1885.

To Hon. RUSSELL A. ALGER,
Governor of the State of Michigan:

Sir:—In compliance with the laws of this State, I present to you the accompanying Report for the fiscal year ending September 30, 1885.

Very respectfully,
Henry B. Baker,
Secretary of the State Board of Health.

RESOLUTION OF THE BOARD RELATIVE TO PAPERS PUBLISHED IN ITS ANNUAL REPORT.

Resolved, That no papers shall be published in the Annual Report of this Board except such as are ordered or approved for purposes of such publication by a majority of the members of the Board; and that any such paper shall be published over the signature of the writer, who shall be entitled to the credit of its production, as well as responsible for the statements of facts and opinions expressed therein.

CONTENTS.

PAGE.
Presentation of Report to the Governor ... iii
Resolution relative to Papers in Annual Report ... iv
Members of the Board, Residences, Terms of Office, Standing Committees, etc ... vii-viii
Work of the Board, and work in the Office, fiscal year 1885 ... viii
  Collection and Compilation of Information, fiscal year 1884 ... viii-ix
    Relative to Annual Reports for 1884 by Health officers and Clerks of Local Boards of Health ... viii
    Relative to Weekly Reports of Sickness and Meteorological Reports ... viii-ix, x
    Relative to return of names and addresses of Health officers, 1885-6 ... ix-x
  Dissemination of Information ... x-xii
  Secretary's report of Property, Additions to Library, etc , fiscal year 1885 ... xiii
  Abstracts from Proceedings at Meetings of Board, fiscal year 1885 ... xxviii-xxxiv
  Abstracts of Secretary's Quarterly Reports to the Board, of Work done in the office.... xxxv-xxxviii.
  Special Reports, etc ... xxxviii
Principal Meteorological Conditions in Michigan in 1884, Compilation by the Secretary ... 1-86
Time of Greatest Prevalence of each Disease.—Contributions to the Study of the Causes of Diseases.—Report by the Secretary ... 87-151
Conferences of Representatives of State Boards of Health.—Report by the Secretary ... 151-170
Testing Illuminating Oil in Michigan.—Report by the Secretary ... 170-173
Laws of Michigan, passed in 1885, relating to Public Health and Safety ... 174
Examination of the State House of Correction and Reformatory at Ionia, Mich.—Report by Drs. Avery and Tyler ... 175-176
Examinations of Plans for Public Buildings.—Year ending September 30, 1885 ... 177-182
The Prevention of the Introduction of Communicable Diseases.—Circular of Michigan State Board of Health, August, 1885 ... 183-190
Good Health Results from Sanitary Work.—Report by the Secretary ... 191-195
State Health Inspection of Travel.—Report by the Secretary ... 196-217
Poisonous Cheese.—Report by Geo. M. Sternberg, M. D ... 218-220
Poisonous Cheese.—Report by Victor C. Vaughan, M. D ... 220-226
Communicable Diseases in Michigan during the year ending December 31, 1885.—Report by the Secretary ... 227-282
  Diphtheria ... 227-252
  Scarlet Fever ... 252-263
  Small-pox ... 263-272
  Glanders ... 272-276
  Typhoid Fever ... 276-280
  Measles ... 280-281
  Whooping-Cough ... 281-282

ILLUSTRATIONS.

Diagrams, Meteorological Conditions in Michigan, by months, in 1884:

  Average Temperature ... 29
  Average Daily Range of Temperature ... 34
  Absolute Humidity ... 37
  Relative Humidity ... 41
  Fogs ... 43

PAGE.
Diagrams, Average per cent of cloudiness 48
  Rainfall 55
  Ozone, average by day 64
  Ozone, average by night 66
  Velocity of Wind, by hours and months 70
  Velocity of Wind, by months 73
  Direction of Wind in Michigan, year and months 74
  Direction of Wind at Stations in Michigan, in 1884 74
  Direction of Wind at Stations, by months in 1884 76
  Atmospheric Pressure 85

Diagrams, Diseases in Michigan, by Months in 1884:

  Bronchitis, Pneumonia, Diarrhea, Dysentery, Cholera Infantum, Cholera Morbus 95
  Diphtheria, Scarlatina, Tonsilitis, Influenza, Membranous Croup, Small-pox 129
  Rheumatism, Neuralgia, Measles, Erysipelas, Whooping-cough, Puerperal Fever, Inflammation of Kidney 133
  Consumption, Inflammation of Brain, Inflammation of Bowels, Average for 26 Diseases, 135
  Intermittent, Remittent, Typhoid, Typho-malarial Fevers, Cerebro-spinal Meningitis... 142
Map of Michigan, showing Distribution of Diphtheria in Mich., 1885 230
Map of Michigan, showing Distribution of Scarlet Fever in Mich., 1885 253

REPORT.

This is the thirteenth Annual Report of the Secretary of the State Board of Health, and is for the fiscal year ending September 30, 1885. It is arranged and paged in two parts. The first contains the Secretary's report of work of the Board, the annual report of property, including accessions to the library with names of donors. The second part contains thirteen papers, abstracts, and reports.

To this Report there are supplements containing proceedings and addresses at the sanitary conventions held at East Saginaw, December 2 and 3, 1884; at Lansing, March 19 and 20, 1885; and at Ypsilanti, June 30 and July 1, 1885.

The papers are printed subject to a resolution of the Board, on page iv.

The names and postoffice addresses of the members of the Board, and the date of the expiration of their terms of office, are as follows:

ARTHUR HAZLEWOOD, M. D., Grand Rapids, Jan. 31, 1887.
JOHN AVERY, M. D., *President of the Board*, Greenville, Jan. 31, 1887.
VICTOR C. VAUGHAN, M. D., Ph. D., Ann Arbor, Jan. 31, 1889.
C. V. TYLER, M. D., Bay City, Jan. 31, 1889.
HENRY F. LYSTER, A. M., M. D., Detroit, Jan. 31, 1891.
JOHN H. KELLOGG, M. D., Battle Creek, Jan. 31, 1891.
HENRY B. BAKER, M. D., *Secretary of the Board*, Lansing.

The members of the State Board of Health, with the exception of the secretary, are appointed for the term of six years, and receive no salary for their services.

STANDING COMMITTEES.

1. Epidemic, Endemic and Contagious Diseases.—H. F. Lyster, M. D.
2. Sewerage and Drainage.—H. F. Lyster, M. D.
3. Foods, Drinks, and Water-Supply.—V. C. Vaughan, M. D.
4. Buildings, including Ventilation, Heating, etc.—John Avery, M. D.
5. Climate, Geology, Topography, etc.—Henry B. Baker, M. D.
6. Disposal of Excreta.—John H. Kellogg, M. D.
7. Poisons, Explosives, etc.—V. C. Vaughan, M. D.
8. Occupations, Recreations and Habits.—J. H. Kellogg, M. D.
9. Relations of Schools to Health.—John Avery, M. D.
10. Sanitary Survey.—C. V. Tyler, M. D.
11. The Death-Rate, as Influenced by Age.—Henry B. Baker, M. D.
12. Legislation.—C. V. Tyler, M. D.
13. Finances of the Board.—Arthur Hazlewood, M. D.

14. Mental Hygiene.—Arthur Hazlewood, M. D.
15. Diseases of Animals Dangerous to Man.—Henry B. Baker, M. D.
16. Relations of Preventable Sickness to Taxation.—J. H. Kellogg, M. D.

WORK OF THE OFFICE OF THE BOARD, FISCAL YEAR 1884.

The work of the office naturally groups itself under three closely related heads,—the collection of information, the compilation and elaboration of information, and the dissemination of information. In the following outline that grouping has been made in part only in order to avoid repetition.

COLLECTION AND COMPILATION OF INFORMATION.

ANNUAL REPORTS BY HEALTH OFFICERS FOR THE YEAR ENDING DEC. 31, 1884.

In January, 1885, a circular (78) which had been approved by the Board, was sent to the health officer of each township, city, and village in the State, about 1,422 in all, transmitting a blank form [I] for use in making his annual report to this office. This circular was substantially the same as circular 65 which was sent the year before. It has been printed in former Reports, with no material change, and also blank form I for report of health officers; it is therefore not printed in this Report. The circular (78) also transmitted a blank for a copy of the record of diseases dangerous to the public health, similar to the blank which is printed, reduced in size, on page 271 of the Report for 1882.

ANNUAL REPORTS BY CLERKS OF LOCAL BOARDS OF HEALTH, FOR THE YEAR ENDING DEC. 31, 1884.

At the same time (January, 1885) that the circulars and blank forms were sent to the health officers, a circular (79) asking for a report, and a blank form [J] on which to make a report, were sent to the clerk of the local board of health of each township, city, and village in the State, about 1,422 in all. A blank form for a copy of his record of cases of diseases dangerous to public health was also sent, the circular and blank form sent to the clerk were similar to those sent to the health officer, except that they were not so explicit in questions relating to sickness and deaths.

A compilation of replies by 26 correspondents to circular 98, relative to diseases in Michigan in 1884, and some conditions coincident therewith, was made and placed on file in the office of the Board.

WEEKLY REPORTS OF DISEASES IN 1884.

A list of observers for the calendar year 1884 is printed on pages 114–116. A compilation of reports, with a study of relations of sickness to climatic conditions is printed on page 87–151. A copy of the circular (61) used in asking for reports by health officers of villages is printed on page xii. of the Report for 1883.

HEALTH BULLETINS.

The weekly reports of diseases received up to Wednesday of the week following the week for which they are made, are compiled on that day, week by week, and a bulletin, based on the compilation, is sent for publication to a large number of newspapers, and to sanitary and medical journals. A telegraphic abstract from the compilation is also sent weekly to a Michigan Press

Association. A specimen of this weekly health bulletin can be found on page xii. of the Report for 1884. Beginning with the month of August, 1884, a monthly health bulletin has been issued immediately after the close of each month, for the use of monthly sanitary and medical journals. The following is a copy of the bulletin for the month of August, 1885:—

HEALTH IN MICHIGAN, AUGUST, 1885.

Reports to the State Board of Health, Lansing, by observers in different parts of the State, show the diseases which caused most sickness in Michigan during the month of August (4 weeks ending Aug. 29), 1885, as follows:

Number of Weekly reports received, 310.		For Preceding Month.
Diseases Arranged in Order of Greatest Prevalence.	Per cent of Reports Stating Presence of Disease.	Per cent of Reports Stating Presence of Disease.
Diarrhea	80	62
Intermittent fever	63	65
Rheumatism	58	59
Neuralgia	56	58
Cholera morbus	52	39
Consumption of lungs	49	48
Remittent fever	41	30
Tonsilitis	38	36
Bronchitis	37	41
Cholera infantum	37	20
Dysentery	33	15
Influenza	18	18
Inflammation of bowels	18	16
Whooping-cough	17	14
Inflammation of kidney	17	17
Erysipelas	17	21
Diphtheria	13	11
Typho-malarial fever	12	10
Pneumonia	11	10
Scarlet fever	10	11
Typhoid fever (enteric)	9	6
Inflammation of brain	6	6
Cerebro-spinal meningitis	6	8
Puerperal fever	6	6
Membranous croup	2	1
Measles	2	8

For the month of August, 1885, compared with the preceding month, the reports indicate that diarrhea, dysentery, cholera infantum, cholera morbus, and remittent fever increased in prevalence.

Compared with the average for the month of August in the seven years, 1879-1885, dysentery, intermittent fever, remittent fever, typho-malarial fever, cholera infantum, consumption of lungs, cholera morbus, diarrhea, and influenza were less prevalent in August, 1885.

For the month of August, 1885, compared with the average of corresponding months for the seven years, 1879-1885, the temperature was much lower, the absolute humidity about the same, and the relative humidity and the day and the night ozone were more.

Including reports by regular observers and others, diphtheria was reported in Michigan in the month of August, 1885, at thirty-five places, namely—Au Sable, Burt, Burlington, Bingham tp., Cadillac, Calumet tp., Coldwater, Detroit, Dundee, Hartford, Harbor Springs, Hart, Ithaca, Jackson, Kalamazoo, Lapeer, Lansing, Mason, Muskegon, North Star tp., Paw Paw, Pierson, Pierson tp., Pontiac, Pinconning, Ray tp., Rose Lake tp., Romeo, Rolland, Reynolds tp., Sherman, Owosso, Union City, West Bloomfield, Wyandotte; Scarlet fever at nineteen places—Bay City, Calumet, Detroit, Dowagiac, Dundee, Fairfield, Jackson, Kalamazoo, Kaw Kawlin, Metamora, Montague, New Baltimore, Northville, North Star tp., Owosso, Paw Paw, South Haven, Tecumseh, Venice tp.; Typhoid fever at sixteen places—Adrian, Almont, Algonac, Caro, Detroit, Hartford, Houghton, Humboldt, Ionia, Jackson, Lansing, Pontiac, Reading, Sherman, Watervleit, Wyandotte; and Measles at four places—Columbiaville, Detroit, Houghton, and Ishpeming. **HENRY B. BAKER,**

LANSING, Sept. 3, 1885. ***Secretary.***

NAMES AND ADDRESSES OF HEALTH OFFICERS OF TOWNSHIPS, CITIES, AND VILLAGES.

This office endeavors to maintain communication with every local board of health, and, that this may be done, keeps a carefully corrected list of all health officers returned in accordance with requirements of the law. Most of the health officers are appointed soon after the spring elections.

In April, 1885, a circular was sent to supervisors of townships (No. 82), presidents and clerks of villages (No. 83), and mayors and clerks of cities (No. 84), (1,679 persons in all), transmitting a blank form (E or F) for return of the name and post-office address, and certain other facts respecting persons appointed as health officers for the year 1885-6. The circular and blank form are printed on pages xiii.-xiv. of the Report for 1884.

In June the circular and blank form were sent again to 554 localities from which no return of a health officer had been received. In July a printed list of the names and addresses of the health officers was ordered published but it was delayed in the printers' hands until September, when it was printed and distributed to local boards for their use. Up to the date of the publication of this list the whole number of health officers returned for 1885 was, in townships, 978; in villages, 189; in cities, 50: only 205 out of 1,422 localities being delinquent. The publication of this list proved useful in several ways, acting as a stimulus to the local boards, enabling them more easily to inform neighboring boards of the presence of dangerous communicable diseases, and securing to this office more prompt and complete returns.

As fast as addresses of health officers for 1885 were received, there were sent to each such officer enough copies of the revised circular on the work of health officers and local boards to supply each member of the board with a copy; one copy of the document on the restriction and prevention of diphtheria (No. 76), a copy of that on the restriction and prevention of smallpox (No. 54), the revised document on the restriction and prevention of scarlet fever (No. 72), and a sample sheet of a blank record for a local record of communicable diseases; and a blank form [L] for notification to this office of an outbreak of a dangerous communicable disease was also included in the package sent to each health officer. During the year about 75,000 copies of the several documents on the restriction and prevention of certain contagious diseases, have been sent to local officers and others, for general distribution in this State, and especially for distribution in localities where such diseases were reported present.

METEOROLOGICAL REPORTS.

A list of meteorological observers for the calendar year 1884, with a statement of what registers were received from each, is printed on page 6. The reports are summarized in an article on the Principal Meteorological Conditions in Michigan in the Year 1884, on pages 1–86. The data is of great value for purposes of studying the causes of diseases. The observations made at the office of the Board, at Lansing, have been summarized weekly, and a copy of the summary has been furnished for publication to the *Lansing Republican*. Reprints from this have been distributed weekly to the meteorological observers, and monthly to observers of diseases, and to the sanitary journals and other exchanges of the office of the Board, in order to facilitate studies on the relations of meteorological conditions to health. The report for the week ending Saturday, October 4, 1884, containing a summary for September, may serve as a sample, and is printed on page xv. of the Annual Report for 1884.

THE PREVENTION OF THE INTRODUCTION OF COMMUNICABLE DISEASES.

The document on this subject, issued in August, 1885, is printed on pages 183–190.

EXAMINATION OF STATE HOUSE OF CORRECTION AT IONIA.

See pages 175–176 of this Report.

EXAMINATION OF PLANS FOR PUBLIC BUILDINGS.

A report of examinations for the year ending September 30, 1885, is printed on pages 177–182.

POISONOUS CHEESE.

A report by Dr. Victor C. Vaughan on this subject is printed on pages 221–226 and one by Geo. M. Sternberg, M. D., is printed on pages 218–220 of this Report.

STATE HEALTH INSPECTION OF TRAVEL, ETC.

The efforts made by the Board, and by the United States Government, to prevent the introduction of small-pox into Michigan from Montreal, and the efforts of the Board to place the lumbering camps of Michigan in a good condition for restricting the spread of the disease should it appear among them, are told on pages 196–217 of this Report.

CONFERENCES OF STATE BOARDS OF HEALTH.

The Secretary of the Board was sent as delegate of the Board to the Conferences of State Boards of Health, held in St. Louis and Washington, in October and December, 1884. His report is printed on pages 151–170 of this Report.

INSPECTION OF ILLUMINATING OILS IN MICHIGAN.

A report on this subject is printed on pages 171–173.

BOOKS AND PERIODICALS.

A list of the books and periodicals received by the library of the Board by purchase, exchange and gift is given in the annual report of property, on the following pages, together with the names and addresses of the donors. The total number of entries in the library Sept. 30, 1885, is 5,169. This library is at the service of sanitarians throughout the State, and frequent use is made of it by this class of citizens, especially by those who prepare papers for sanitary conventions.

GOOD HEALTH RESULTS FROM SANITARY WORK.

An article on this subject is printed on pages 191–195.

LAWS OF MICHIGAN, 1885, RELATING TO PUBLIC HEALTH AND SAFETY.

The numbers and titles of these Acts are given on page 174.

OTHER DISSEMINATION OF INFORMATION.

On receipt of the names and addresses of health officers, documents on restriction and prevention of diphtheria, of scarlet fever, and of small-pox, and on work of health officers and local boards of health, are sent to each.

Whenever information is received of the occurrence of diphtheria, scarlet fever, or small-pox, copies of a document on the restriction and prevention of the disease reported are immediately sent to the health officer, with a request that he distribute them where they will be likely to be read. Copies of these documents in German or in Dutch are also sent when it is thought that they can be used to advantage. Owing to frequent requests for documents in French, Polish, Swedish, and Danish-Norwegian, translations of a leaflet on contagious diseases (47) have been made into each of these languages; and copies are sent to local boards when so requested.

Although no specially prepared document on the restriction and prevention of typhoid fever was issued during the year, an effort was made by correspondence to induce a general effort to prevent the disease. Whenever information was received of an outbreak, a letter was sent to the local health officer calling his attention to the probable source and method of spread of the disease, and suggesting ways for guarding against such spread,—such as the inspection of the drinking-water used by the family and its possible disuse, and the disinfection of the discharges from the bowels of all typhoid fever patients. As a disinfectant, "Standard Solution No. 1," of the American Public Health Association's committee, was recommended. The solution is made by adding to each gallon of soft water four ounces of chloride of lime of the best quality, which should contain at least 25 per cent. of available chlorine. "Use one pint of this solution for the disinfection of each discharge in cholera, typhoid fever, etc. Mix well, and leave in vessel for at least ten minutes before throwing into privy-vault or water-closet."

A large number of letters and documents have been sent in response to inquiries from health officers and others in regard to what should be done about glanders in horses, and about nuisances, etc.

In the summer of 1885, the danger of the introduction of cholera still being considered great, the Board ordered the revision of the document issued in 1884 on "Prevention and Restriction of Cholera," and the printing and distribution of 20,000 copies. The one issued in 1884 is printed on pages 47-51 of the Report of the Board for 1884. The revised document can be had by applying to the Secretary of the Board, at Lansing.

It has been found that the documents of this Board relating to the restriction and prevention of communicable diseases are read by people when they are in fear of taking such diseases from cases in their vicinity.

Numerous requests have been received from local officers, from teachers, newspapers, etc., for documents relating to diphtheria, scarlet fever, and small-pox, and in a number of cases many copies have been used by teachers of physiology and hygiene in their classes in the public schools.

Every effort has been made to disseminate a knowledge of the nature of contagious diseases and the danger therefrom, and the results have been in the main highly gratifying. Some account of this branch of the work of this office may be seen in an article on The Communicable Diseases in Michigan, commencing on page 227.

The Annual Report of this Board for the year 1884 has been distributed to all health officers whose names have been reported to this office, to presidents and clerks of city and village boards of health, and to many other officers and citizens interested in public health work. Abstracts of the proceedings at quarterly meetings of the Board have been prepared and given to the press.

The correspondence of the office with local health authorities, and with others, on sanitary subjects has been large, those communications copied covering 3,345 letter-book pages, and not including all postals, of which a large number have been sent out.

REPORT OF THE SECRETARY RELATIVE TO PROPERTY, ETC., FOR THE FISCAL YEAR ENDING SEPTEMBER 30, 1885.

To the President and Members of the Michigan State Board of Health:

GENTLEMEN:—In compliance with Section 5 of Article II of the by-laws of this Board, the following report of the "Nature and amount of property belonging to the Board, which has been received, issued, expended and destroyed since the last report, and of the property remaining on hand, and also in whose care each item of property is intrusted," is respectfully submitted:

For an account of the instruments and articles of a similar nature, which were on hand at the time of making the last reports, you are respectfully referred to pages xii-xv of the Report for 1875, xxvii-xxxi for 1876, xl-liv for 1877, xxxv-xlviii for 1878, xix-xliii for 1879, xxi-xxxvi for 1880, xviii-xxxii for 1881, xv-xxvi for 1882, xvi-xvii for 1883, and xvii-xxxii for 1884. Since that time articles of this class have been purchased as follows:

4 Barometers.
3 Sets Reg. Thermometers.
1 Maximum Reg. Thermometer.
1 Minimum Registering Thermometer.
8 Rain Guages, with overflow tubes.
1 Standard Thermometer.
1 Spindle for Anemometer.
3 Psychrometers, complete.
5 Electrotype Plates, Diseases in Michigan in 1884.
15 Electrotype Plates, Meteorological Conditions in Michigan in 1883.
6 Electrotype Plates, Meteorological Conditions in Michigan in 1884.
4 Drawing Pens.
1 Drawing Pen Handle.
1 Cake Photo-Drawing Ink.
1 Boxwood Rule, 12 inches.
1 Magnifying Glass.

Meteorological instruments have been entrusted to observers as follows:

Psychrometer, set of registering thermometers, barometer and rain gauge, to S. Alexander, Birmingham.

Psychrometer and rain gauge to John P. Stoddard, Muskegon.

The barometer, psychrometer, set of registering thermometers and rain gauge at Ionia were transferred by Rev. J. Pierson, D. D., to Gordon A. Willetts, and by Mr. Willetts to Prof. J. W. Ewing, who is continuing the observations for that station.

Rain gauge to Lieut. A. H. Boies, Hudson.

Minimum thermometer to J. H. Kellogg, M. D., Battle Creek.

Barometer, set of registering thermometers, rain gauge, and cup for psychrometer to A. W. Nicholson, M. D., Boyne City.

Psychrometer, set of registering thermometers, and rain gauge to G. H. Cleveland, Moorestown. The observer moved to Pentwater in July, where the observations will hereafter be taken.

Barometer to G. G. Gordon, M. D., Swartz Creek.

The barometer in use at the office of the Secretary of the State Board of Health was transferred to S. Alexander, Birmingham, and a new one put in use in its place.

Set of registering thermometers to John W. Kimball, Port Austin.

Barometer, psychrometer, set of registering thermometers, and rain gauge, to John J. Granville, East Saginaw.

Instruments, etc., remaining in the office of the Board, September 30, 1885:

3 Sets registering thermometers, complete.
4 Psychrometers, complete.
4 Dry bulb thermometers.
4 Wet bulb thermometers.
2 Standard thermometers.
1 Stem-graduated 9-inch thermometer, in rubber lined brass case (for testing oils), 3.25.
1 Thermometer, No. 4334.
4 Psychrometer cups, rusted and spoiled by long exposure.
9 Thermometer clips.
3 Thermometers, broken accidentally, and returned by observers.
4 Psychrometer cups, new.
2 Caps, for overflow tubes to rain gauges.
2 Bunches psychrometer wicking.
1 Worn out anemometer spindle.
1 Rain gauge tube.
1 Psychrometer board, with clips.

Books and other publications have been received and placed in the library of the Board (during the year ending Sept. 30, 1885), as follows:

BY PURCHASE:

Health Hints for Travelers.—Sundberg.
The Formation of Poisons by Micro-organisms.—Black.
Healthy Schools.—Paget.
Encyclopedia Brittanica.—Vol. XVII.
The Collective Investigation Record, British Medical Association, July, 1883; Vol. II. July, 1884.
Epidemics from a Chemical Standpoint.—Doremus.
Report of Commissioners of Emigration of N. Y. 1849.
Ann. Rep. of Commissioners of Emigration of N. Y., 1850.
Quarantine.—The Importance of the Institution.

Vergleichende Morphologie und Biologie der Pilze Mycetozoen und Bacterien. De Bary.
L'Epidemie de Fièvre Typhoide a Paris en 1882. Etudes Statistiques.—Extrait du Journal de la Société de Statistique de Paris, December, 1883. —A. Durand Claye.
An Epitome of reports of Med. Officers to Chinese Imp. Maritime Customs Service from 1871-1882. —Gordon.
Lock-Jaw of Infants.—History, Cause, Prevention and Cure.—Hartigan.
The Elements of Pathology.—Rindfleisch.
A Dictionary of Practical Medicine.—Copland.
How to Foretell the Weather with the Pocket Spectroscope.—Cory.
Transactions of Sanitary Institute of Great Britain, Volumes I, II, III, IV, V.
A Synopsis of the Bacteria and Yeast Fungi.—Grove.
L'Epidèmie de Fièvre Typhoide a Paris en 1882.—Durand Claye.
Hygiene; Its Principles as applied to Public Health.—Willoughby.
Code of Rules for Prevention of Infectious and Contagious Diseases in Schools.
Encyclopedia Britannica.—Vol. XVIII.— Orn—Pht.
What to do in Cases of Poisoning, 4th Ed.—Murrell.
Women, Plumbers and Doctors.—Plunkett.
Maxims of Public Health.—Wight.
Dirty Dustbins and Sloppy Streets.—Boulnois.
Cinquième Congrès International D'Hygiène et de Démographie a la Haye. Tome I.—Organization—Séances générales—Premiere Section.
Mich. State Gazetteer and Business Directory, 1885.
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Sewerage and Water Supply.—Erwin F. Smith.
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Smith, Erwin F., Lansing, Mich.:—

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Veale, M., Philadelphia, Pa.:-

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Willard, Prof. J. T., Manhattan, Ks.:—

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Hints on Building School Houses.

Young, Wm., London, Eng:—

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From———

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Excepting certain publications drawn out by members of the board and others, the foregoing together with those accounted for at date of the last annual report as in the library, or drawn out, are in the library and in good condition. Those drawn out, and not yet returned, are as follows:

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Memoirs on Diphtheria, Library No. 716.
Prevention of Cholera Infantum and Kindred Disorders, No. 1528.

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An Ordinance Relative to the Appointment and Duties of the City Physician of West Bay City, No. 1760.
Sanitary Chart on Management of Infants, No. 2515.

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Circular of Inquiry by Wis. Bd. of Health to School Teachers.
13th Ann. Report of Health Dep. Cincinnati, O., 1879, No. 2009.
Sanitary Engineer for Feb. 15, 1881.

BY HENRY F. LYSTER, M. D.

Separate System of Drainage, No. 326.
Public Health, June 9, 1876.
Uppingham By-Laws and Regulations on House Drainage, No. 966.
Plumber and Sanitary Engineer, Oct., Nov., Dec., 1878.
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Twelve Photographs, Illustrative of Influence of Climate on Phthisis and Rheumatism, No. 1595.
Playter's Elementary Anatomy, Physiology and Hygiene, No. 1762.
Circular on Drainage, Mass. State Board of Health, Nos. 1367 and 1599.

BY JOHN H. KELLOGG, M. D.

Nat. Board of Health Bulletin, Sup. No. 7, 1880, and No. 17, 1882, Nos. 3840, 3841.
Collective Investigation of Diphtheria, No. 3842.
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BY HENRY B. BAKER, M. D.

Journal of Hygiene (French) for Sept., 1881.
Vol. 35 Med. Chir. Soc. Trans., London, No. 2642.
N. Y. Med. Abstract, Apr. 1883.
College and Clinical Record, May, 1884.
The Typhoid Fever of America, No. 3905.
Jour. Franklin Inst., Nov., 1884.
Buffalo Med. and Surgical Journal, Aug., 1885.

BY BELA COGSHALL, M. D.

Scientific American, July 5, 1879.

BY PROFESSOR T. J. BURRILL.

New York Medical Abstract, July, 1884.

BY JOHN AVERY, M. D.

Trans. of Mich. State Med. Soc. 1874, No. 73.
Am. Public Health Ass'n, Vols. IV, V, VI, Nos. 3236, 3237, 3238.

BY C. C. YEMANS.

Report on Plans for Securing Records of Deaths, No. 1708.
State Boards of Health, Indiana, etc., Stevens, No. 3395.
Some Fallacies of Statistics, Rumsey, No. 678.
Death Rate of Each Sex in Mich., Baker, No. 538.

BY HON. W. W. ROOT, M. D.

Sanitary Work in Lansing, Mich., No. 2061,
Mayor's Address, Aurora, Ill., 1879, No. 1414.

BY ARTHUR HAZLEWOOD, M. D.

The Practitioner, August, 1885.

BY M. T. GASS.

Registration of Plumbers, etc., Health Dep't N. Y. City, No. 3215.

BY BION WHELAN, M. D.

Notice to Householders of Presence of Contagious Disease, and Establishing Quarantine, Issued by Board of Health of St. Clair City, No. 2624.
"Health Regulations" of the Village of Tecumseh.
Orders, Regulations and Suggestions of the Board of Health of Mt. Pleasant, N. Y., No. 4045.
Sanitary Work in the Smaller Towns and Villages, No. 657.
Handbook of Rural Sanitary Science, Marsh, No. 650.
Hygeia—A City of Health—Richardson, No. 744.
The Future of Sanitary Science, Richardson, No. 1171.
Maxims of Public Health, Wight, No. 4889.
Dirty Dustbins and Sloppy Streets, Boulnois, No. 4890.
Transactions of Sanitary Institute of Great Britain, Vol. V, No. 4672,
New Hampshire State B'd of Health Rep., 1884, No. 4581.
Parke's Hygiene, Am. Edition, 1884, No. 4038.

BY PROF. VICTOR C. VAUGHAN, M. D.

Tenth Annual Report of the Local Gov't B'd, 1880-1881, No. 2765. Le Service Communal de la Disinfection a Bruxelles, No. 4616.

BY S. W. LA DU.

Four Pamphlets on Examination of Illuminating Oils, Nos. 2979, 1429, 3656, 1432.

WEEKLY OR MONTHLY MORTALITY STATEMENTS.

These have been received during the past year from health officers, registrars, officers of boards of health, or of cities in the United States or foreign countries, as follows :—

Abbott, M. D., S. W., Health Officer, Department of Health, State House, Boston, Mass.
Ashmun, M. D., G. C., Health Officer, Cleveland, Ohio.
Baldwin, Cyrus W., Registrar, Paterson, N. J.
Bidenkap, Dr., chef del 'Administration Sanitaire, Christiana, Norway.
Boyd, Geo., Registrar Vital Statistics, Paterson, N. J.
Boyd, M. D., S. B., Secretary Board of Health, Knoxville, Tenn.
Briggs, M. D., Albert H., Health Physician, and Registrar Vital Statistics, Buffalo, N. Y.
Buck, M. D., E. W., Health Officer and City Physician, Oakland, Cal.
Bureau d' Hygine, Havre, France.
Bureau de Demographie et de la Statistique Medical de la Ville, Marseilles, France.
Cabell, M. D., J. G., Pres't. Board of Health, Richmond, Va.
Carroll, M. D., Alfred L., Sec. State Board of Health, Albany, N. Y.
Carson, M. D., Gib. W., Clerk, Health Commissioner and Board of Health, St. Louis, Mo.
Carter, A. Robert, Sec. City Board of Health, Baltimore, Md.
Cargill, H. N., Clerk of Board of Health, Grand Rapids, Mich.
Cocchi, A., Il Direttore, Dell' Officio di Statistica e Stato Della citer di Roma, Rome Italy.
Day, M. D., Walter De F., Sanitary Supt., and Registrar, N. Y. City.
Det. Kgl. Sundheds Collegium, Copenhagen, Denmark.
Fraser, M. D., E. B., Registrar, Wilmington, Del.
Fuchs, Dr. J. M., Secretaris Commissie van Toezicht op den Stedelyken Geneeskundigen Dienst, Amsterdam, Netherlands.
Galt, M. D., James D., Health Officer, Norfolk, Va.
Gleason, M. D., M. K., Registrar Vital Statistics, and De Wolf, M. D., O. C., Health Officer, and Tomlinson, A. M., M. D., Registrar of Vital Statistics, Chicago, Ill.
Grimshaw, M. D., Thomas W., Registrar General, Dublin, Ireland.
Horlbeck, M. D., H. B., City Registrar, Charleston, S. C.
Hoyt, Henry F., Health Officer, Jones, Talbot, Health Officer, St. Paul, Minn.
Holt, M. D., Joseph, President of State Board of Health, New Orleans, Louisiana.
LaRocque, M. D., A. B., Medical Health Officer, Montreal, P. Q.
Lindsley, M. D., C. A., Health Officer, New Haven, Conn.
Linsley, M. D., J. H., Health Officer, Burlington, Vt.
Martin, M. D., R., Commissioner of Health, Milwaukee, Wisconsin.
Mitchell, M. D., Chas., Health Officer and Registrar, Nashville, Tenn.
Robinson, M. D., D. E., Health Officer of Manistee, Mich.
Rouse, M. D., J. S., Health Officer, East Saginaw, Mich.
Scales, M. D., T. S., Health Officer, Mobile, Ala.
Snively, M. D., W., Registrar, Pittsburg, Penn.

Snow, Edwin M., Supt. of Health Providence, R. I.
Statistisches Amt der Stadt Berlin, Berlin, Germany.
Tatham, M. D., John, Medical Officer of Health, Salford, Eng.
Townshend, M. D., Smith, Health Officer and Registrar, Washington, D. C.
Tyrrell, M. D., G. G., Sec. State Board of Health, California.
Watkins, R. N., City Sexton, Lansing, Mich.
Wheeler, M. D., John B., Health Officer, Burlington, Vt.
Wight, M. D., O. W., Health Officer, Detroit, Mich.
Wyckoff, M. D., R. M., Registrar of Records, Brooklyn, N. Y.

Distributions of the various documents on contagious diseases have been made during the year to the amount of many thousand copies, great numbers of these having been sent for distribution in localities where these diseases were present.

The following circulars on Communicable Diseases, and on the work of health officers, are now on hand:—

IN ENGLISH.

Circular No.	Name of Document.	Copies.
No. 54.	Prevention and Restriction of Small-pox (issue of 1882)	7,991
No. 72.	Restriction and Prevention of Scarlet Fever (issue of 1884)	8,976
No. 76.	Restriction and Prevention of Diphtheria (issue of 1884)	7,435
No. 75.	Prevention and Restriction of Cholera (issue of 1884)	29
No. 92.	Prevention and Restriction of Cholera (issue of 1885)	2,771
No. 91.	The Prevention of the Introduction of Communicable Diseases	1,500
No. 86.	Work of Health Officers (issue of 1885)	2,714
No. 93.	Permits for Removal of Sick Persons or Infected Articles	104

IN FOREIGN LANGUAGES.

Circular No.	Name of Document.	Copies.
No. 45.	Restriction and Prevention of Diphtheria (German)	3,815
No. 45.	Restriction and Prevention of Diphtheria (Holland)	1,467
No. 46.	Restriction and Prevention of Scarlet Fever (German)	3,606
No. 46.	Restriction and Prevention of Scarlet Fever (Holland)	4,096
No. 54.	Prevention and Restriction of Small-pox (German)	4,508
No. 54.	Prevention and Restriction of Small-pox (Holland)	4,605
No. 68.	Leaflet on Contagious Diseases (French)	185
No. 69.	Leaflet on Contagious Diseases (Danish-Norwegian)	275
No. 70.	Leaflet on Contagious Diseases (Swedish)	1,200
No. 73.	Leaflet on Contagious Diseases (Polish)	1,000

The following table shows the amount and kind of Hard paper there was on hand at the time of making the last report, the amount purchased during the year, the amount used, and the amount now on hand:—

Kind of Paper.	On hand at Last Report.		Purchased Since Last Report.		Used During the Year.		On Hand Now.	
	Reams.	Sheets.	Reams.	Sheets.	Reams.	Sheets.	Reams.	Sheets.
Medium	....	18	2	....	....	173	1	325
Folio Post	18	220	20	....	22	112	16	108
Demy	1	224	9	....	1	59	9	165
Crown	8	254	10	....	11	131	7	123
Byron Weston	....	....	6	....	5	19	....	461
Cover paper	3	....	7	....	7	390	2	90
Manilla wrapping paper	1	205	3	....	1	397	2	288
Blotting paper	....	107	....	....	....	52	....	55
Book paper	3	240	....	....	2	48	1	192
Foolscap	2	....	....	....	....	120	1	360
Legal cap	2	....	....	....	1	110	....	370
Carbon paper	....	12	....	75	....	27	....	60
Postoffice paper	1	320	....	....	....	....	1	320

The hard paper has been used in making blank books for use in the office, circulars, announcements and programs for sanitary conventions, printed letters, writing paper, etc. The cover paper has been used for covers to reprints and record books for weekly reports of diseases, and wrappers for packages of ozone test-paper.

At the time of making the last report there were about 4,244 sheets of letter and half letter paper. Since that time 14,240 sheets of half letter have been made from folio post paper. There are now on hand about 4,946 sheets of half letter paper, and 286 sheets of note and one-half note paper.

There were about 123,358 envelopes on hand when the last report was made; 96,100 of the various kinds in use in the office have been purchased since, making a total of 219,458. There are on hand now of printed envelopes, 54,906; of blank envelopes, 109,260; making a total of 164,166. About 55,292 have been used in the work of the office.

There was on hand at the time of making the last report $177.85 in postage stamps, postal-cards and postal money. Vouchers for postage have been allowed during the year to the amount of $1,050.00. There is now on hand in postage stamps and unused postal-cards $61.39, and postal money $46.08, a total of $107.47. (This does not include postal-cards printed upon but not yet used.) The cost of postage during the fiscal year has been $1,120.38. Some of the principal items have been as follows:—

Distribution of Annual Reports	$338 73
General distribution of documents and circulars	216 26
Sending weekly meteorological, and monthly mortality statements and weekly bulletins	97 21
Collection and dissemination of statistics and information in regard to diseases	82 42
Sending announcements and programs for sanitary conventions	49 18
Sending meteorological material to observers	12 67
Regular and special correspondence of the office, and all other postage (including a considerable amount for distribution of documents on the restriction of diphtheria, scarlet fever, typhoid fever and small-pox in localities where those diseases occurred)	323 91
	$1,120 38

Thus far this report has given exactly, or approximately, the kind and amount of property received, on hand, and disposed of by this office during the fiscal year ending Sept. 30, 1885. But in order to show exactly how much has been allowed by this board to be expended from the State treasury for all property and all other expenses during the time specified, the following classified statement of expenditures, as shown by all vouchers allowed by this board during the fiscal year, is here presented. It includes vouchers number 1,053 to 1,243 inclusive, and voucher number 1,248.

TOTAL AMOUNT AND CLASSIFICATION OF EXPENDITURES BY THE STATE BOARD OF HEALTH, AS PER VOUCHERS NUMBER 1053 TO 1243 INCLUSIVE, AND NUMBER 1248, ALLOWED DURING THE FISCAL YEAR ENDING SEPT. 30, 1885.

Chemical Analyses		$ 130 00
Engraving, Drawing, Etc		150 50
Expenses of Members,	Attending Meetings	237 61
	Other Official	525 04
Instruments and Books		688 11
Paper, Stationery, etc		508 48
Postage,	Office	1,050 00
	Members	....
Printing and Binding		794 93
Secretary		2,416 65
Special Investigations		286 75
Miscellaneous, includes Express, etc		226 64
Total		$7,014 71

Respectfully Submitted,

HENRY B. BAKER,
Secretary.

Having compared the Secretary's annual report of property received, issued, expended, and destroyed during the fiscal year ending September 30, 1885, with the property book and the record of proceedings, and having examined the foregoing account of expenditures, and compared the same with the books in the Auditor General's office, I find the same to be correct.

ARTHUR HAZLEWOOD,
Committee on Finances of the Board.

LANSING, Mich.

EXPENDITURES BY THE STATE BOARD OF HEALTH IN CALENDAR YEAR, 1885.

The appropriations for the board are made for the calendar year, and the expenses for the calendar year cannot exceed six thousand dollars, ($6,000). The following is a statement of expenditures by the board during the calendar year, 1885:—

CLASSIFIED STATEMENT OF EXPENDITURES BY THE BOARD DURING THE CALENDAR YEAR 1885.

Chemical Analyses		$ 105 00
Expenses of members,	Attending meetings	186 62
	Other Official	283 00
Instruments and books		561 60
Paper, Stationery, etc		481 87
Postage for office		850 00
Printing and binding		741 68
Secretary's salary		2,500 00
Special investigation,		136 75
Miscellaneous		150 06
Total		$5,996 58

EXPENDITURES IN FISCAL YEAR 1884, ON ACCOUNT OF THE BOARD.

The foregoing statements are of all expenditures made during the year 1885 from the annual appropriations of $6,000 placed at the disposal of the Board, for purposes specified in the acts making the appropriations. The clerk hire for the office in the State Capitol, and the expenses of printing and binding the annual reports, are provided for by other laws, and accounts for printing and binding the reports are audited by the State Board of Auditors, and not by the State Board of Health. The annual reports of the State Board of Health are published for the use of the Legislature, and for the Department of State, for distribution; only a portion of them are distributed by the State Board of Health. Although the Board is not required by law to keep an account of such expenditures, through other departments of the Government, it has been thought advisable to make a statement, as complete as practicable, of all expenses growing out of the existence of the Board, even though this is not usually done by State Departments or Boards. Such a statement is as follows:

For Clerks during fiscal year 1884	$6,560 27
For Printing " " "	1,371 96
For Binding " " "	390 00
For Photo-engraved plates in fiscal year 1884, for annual report for 1883	148 17
For paper used in 1884 for report of 1883 (estimated)	900 00
Expenses incident to the examination of plans for public buildings in fiscal year 1884	63 19
	$9,433 59

The above statements for printing, binding, plates, and examination of plans for public buildings, are taken from pages 190-194 of the last annual report of the Board of State Auditors—the one for the fiscal year 1884. As no separate account is kept of the paper for each annual report, that item ($900.00) was estimated by the Secretary of the Board of State Auditors.

EXPENDITURES IN FISCAL YEAR 1885, ON ACCOUNT OF THE BOARD.

With the exception of clerk hire, the following figures are given by the Secretary of the Board of State Auditors:

Clerks	$7,844 12
Printing on annual report for 1884	734 72
Binding on annual report for 1884	350 00
Photo-engraved plates for annual report for 1884	206 12
Paper used in printing annual report for 1884 (estimated by the Secretary of the Board of State Auditors)	800 00
Expenses incident to the examination of plans for public buildings in fiscal year 1884	60 31
	$9,995 27

ABSTRACTS AND BRIEF ACCOUNTS OF THE PROCEEDINGS AT MEETINGS OF THE STATE BOARD OF HEALTH DURING THE YEAR ENDING SEPTEMBER 30, 1885.

REGULAR QUARTERLY MEETING AT LANSING, OCTOBER 7, 1884.

Present: Drs. Lyster, Kellogg, Tyler and Baker.

The secretary presented his annual report of property, which was referred to the committee on finances.

A letter and report of progress by Prof. R. C. Kedzie, in his examination of the influence of saw dust on potable water, was read by the secretary. Samples of water from Ludington, Grand Haven, Bay City, West Bay City, and other samples of water were exhibited. [Prof. Kedzie's report on this subject is printed on pages 81–88 of the Annual Report for 1884.]

A letter and a corrected translation, in the Swedish language, of the document issued by this Board, giving general rules for the management of certain contagious diseases, having been received from Dr. Frederick Eklund, of Stockholm, Sweden, the secretary was directed to have plates made embodying the corrections in the document; and the thanks of the Board were voted to Dr. Eklund.

The secretary read a letter from Dr. Harriet V. Brooks in regard to holding a sanitary convention in East Saginaw. It was voted that Drs. Baker and Tyler visit East Saginaw for the purpose of assisting in making necessary arrangements. [The convention was held in December, 1884, and the proceedings published in pamphlet form.]

Dr. Hazlewood was asked to attend, as a delegate of the Board, the meeting of the State Board of Corrections and Charities, and County Agents and others, in December, 1884.

Communications from the State Board of Corrections and Charities were read, which requested the State Board of Health to make an examination of the State School for Girls at Adrian; of the State House of Correction at Ionia; and into the character of boiler-iron cells in jails. Drs. Kellogg, Vaughan and Lyster were appointed as the committee for the school at Adrian; Drs. Avery and Tyler for the House of Correction at Ionia; and Drs. Lyster and Kellogg to study the question of boiler-iron cells in jails. [The report in regard to the School at Adrian is printed on pages 31–32 of Report for 1884, and that for the House of Correction at Ionia on pages 175–176 of this Report.]

Afternoon Session.

A communication from Dr. H. R. Mills, of Port Huron, Mich., recommending, and giving reasons for, an inspection of immigrants at Sarnia, opposite Port Huron, was read by the secretary. The communication had been endorsed, as approved, by the president and secretary of this board, and had been forwarded to the Secretary of State of the United States, at Washington. No special attention was given the subject by the State department at Washington, but it was referred by that department to the Secretary of the Treasury.

The secretary presented a continuation of his report of the outbreaks of cheese-poisoning in Michigan. [The report is printed on pages 122–128 of Report for 1884.]

A form for the sanitary inspection of premises, used in the inspection as Ann Arbor, Mich., and sent to this office by Dr. Breakey, was presented by the secretary, and favorably commented upon by members of the Board at being a move in the right direction.

The secretary was directed to send the bound volumes of reports of the Board for the year 1883 to all health officers in Michigan direct by mail, postage prepaid.

The secretary was authorized to print, in the Annual Report, correspondence and comments relative to diseased animals, including that relative to glanders. [It is printed on page 4–13 of the Report for 1884.]

The secretary was directed to print in the Annual Report, a report of the examination by the Board of plans for public buildings. [It is printed on pages 33–36 of the Report for 1884.]

The secretary was authorized to compile and print, in the Annual Report, the correspondence relative to communicable diseases in Michigan, during the year and three months ending Dec. 31, 1884. [The compilation is printed on pages 251–290 of the Annual Report for 1884.]

The secretary was directed to issue blank forms and instructions to health officers and clerks of local boards of health, to enable them to make their annual reports to the Board as required by law. He was also directed to issue to the regular correspondents of the Board the circular and blank form provided for the collection of facts relating to the occurrence of sickness and deaths under their observation, and relative to the co-incident conditions, during the year 1884.

Dr. Baker presented his paper on "The Relation of the Depth of Water in Wells to the Causation of Typhoid Fever" prepared to be read before the American Public Health Association. It was ordered printed in the Report for 1884. [It is printed on pages 89–114 of that Report.]

SPECIAL MEETING HELD AT EAST SAGINAW, DEC. 3, 1884.

This meeting was held at the time of the meeting of the Sanitary Convention in East Saginaw. Present: Drs. Kellogg, Lyster, Vaughan, Tyler, and Baker.

After the auditing of bills, it was voted that Dr. G. M. Sternberg, Surgeon U. S. Army, be asked to experiment with the cheese which has caused sickness in Michigan, with a view to ascertaining more certainly as to the cause of the sickness, and that the expense incurred thereby shall not exceed one hundred dollars. [Dr. Sternberg's report is printed on pages 218–220].

Dr. Kellogg offered the following resolution, which was adopted:—

Resolved, That the by-law fixing the salary of the secretary of the Board at two thousand dollars be so changed as to allow him for his services, the sum of two thousand five hundred dollars per year, beginning with Dec. 1, 1884.

The question of issuing a revised edition of the document on the prevention and restriction of cholera, including directions what to do in case the disease occurs, was discussed. It was suggested that better action could be taken after the conference of representatives of State Boards of Health to be held in Washington, D. C., Dec. 10.

REGULAR QUARTERLY MEETING AT LANSING, JANUARY 13, 1885.

Present: John Avery, M. D., President; Drs. Lyster, Hazlewood, Tyler, and Baker.

The forenoon was devoted, after the auditing of bills, to the discussion of questions of public-health interest, but no formal action on any of them was taken.

Afternoon Session.

The secretary mentioned a recent ordinance by the common council of Brighton, Mich., prohibiting placing bodies of persons dead of diphtheria in vaults, within the jurisdiction of such council.

It was voted that the secretary prepare a report of the meeting of the Conference of State Boards of Health in St. Louis, Mo., in Oct., 1884, for publication in the Annual Report for 1885; also a report of the meeting of the same organization at Washington, D. C., in December, 1884. [These reports are printed on pages 151–170.]

Dr. Avery brought up the question, When do expenses incurred by a local board of health, in the restriction of a communicable disease, become a charge against the county? It seemed to be the unanimous opinion of members present that it was only when the "person himself, his parents, or other person who may be liable for his support," is not able to pay, in which case it is "at the charge of the county to which he belongs," as per section 1706, Compiled Laws of 1871, being section 1647 of Howell's Annotated Statutes.

Dr. Hazlewood, committee on finances of the Board, reported having examined the books in the office of the secretary, and compared them with the books in the office of the Auditor General, and that he had found the secretary's annual report relative to the finances of the Board for the fiscal year ending Sept. 30, 1884, correct. [The secretary's report of the finances is printed on page xxviii of the Annual Report for 1884.]

The question of reporting to the local board of health diseases of animals, such as hydrophobia and glanders, that may be communicated to man, was discussed; also a proposed legal State standard for milk, and the present law relative to the inspection of buildings. These subjects were referred to appropriate committees. [Bills on these subjects were subsequently introduced into the legislature.]

Dr. Hazlewood, as the committee on Mental Hygiene, moved that E. H. Van Deusen, M. D., of Kalamazoo, Mich., be invited by the Board to prepare a paper on the subject of mental hygiene, with a view to the publication of the paper in the Annual Report of the Board. The motion prevailed.

Dr. Avery read the report of the committee appointed to examine the sanitary condition of the House of Correction at Ionia. It was accepted with thanks, ordered to be printed in the Annual Report of the Board, and the secretary was instructed to place a copy of it in the hands of the committees on public health in both houses of the Legislature; also to send a copy to the State Board of Corrections and Charities. [It is printed on pages 175–176.]

The Board approved, under the law, Dr. Jerome Walker's text-book on Anatomy, Physiology and Hygiene.

The two books by Worthington Hooker, M. D. "Hooker's New Physiology, revised by J. A. Sewall, M. D., with a chapter on Alcohol and Narcotics," and "First Book in Physiology"—were approved conditionally, in accordance with a resolution of the Board, passed July 8, 1884. [Resolution is printed on page 54 of Report for 1884.]

REGULAR ANNUAL MEETING AT LANSING, APRIL 14, 1885.

Present: John Avery, M. D., President; Drs. Hazlewood, Tyler and Baker.

The annual address of the President being in order, Dr. Avery said that he had prepared no formal address. He thanked the members for the many courtesies shown him during his administration. He had no change of policy to recommend to the Board; no marked change, he thought, is desirable. The work is well understood, and is in a satisfactory condition. The Board must be governed somewhat by emergencies, as they arise. He could congratulate the Board on what it had achieved. He thought it would be wise to continue holding sanitary conventions in different places in the State. He spoke of the probable advent of Asiatic cholera, and thought that it might tax the Board to its utmost. The Board had done all it could to prepare to resist the disease, but should be ready for further action. If the bill before the legislature becomes a law, the duties as well as the powers of the State Board of Health to prevent and restrict that disease will be increased. It would be desirable to continue to advise police regulations in cities, adapted to preventing unsanitary conditions and the introduction or spread of cholera; and the health officers of cities, villages and townships of the State, especially as they are just now being changed, many being entirely new to that office, should be instructed in regard to their duties.

The secretary read a report relative to a meeting of the State Oil Inspector and his deputies, at Lansing, held with the view to greater uniformity in methods of testing oils; also a report of efforts with the legislature to induce it to lower the test for illuminating oils, said efforts being made by persons claiming to act in the interest of the smaller manufacturers of refined oil. His report included mention of the action by a committee appointed by the Lansing Sanitary Convention, and the conclusion by that committee that it had not yet been satisfactorily proved that oil which flashes at temperatures lower than 120° F. is reasonably safe.

On motion of Dr. Hazlewood, it was voted that the report by the Secretary be published [it is printed on pages 171–173] together with the statement that in the opinion of the Board there is not sufficient evidence of the safety of oils which flash at temperatures lower than 120° F to warrant the lowering of the test now required for illuminating oils in Michigan.

Afternoon Session.

In addition to those present in the forenoon, Dr. Victor C. Vaughan was present at this session.

The secretary read the report by Dr. G. M. Sternberg on his investigations into the cause of cheese-poisoning, made by request of the Board. [It is printed on pages 218–220].

Dr. Vaughan gave a verbal account of his investigations to ascertain the cause of cheese-poisoning. He had secured one of the poisons. Whether there was another, he was not yet prepared to say. His experiments had been somewhat expensive, especially in the quantity of ether required to make the extract of the poison from the cheese. He would continue them as he was able, and present the completed report at a future time. He said the poison is a volatile one, and that rendered the search for it more difficult. The absence of the odor of rancid butter is not proof that the poison is not butyric acid. [The report as finally submitted by Dr. Vaughan is printed on pages 221–226].

Considerable discussion was had on the subject of sanitary survey. The committee on sanitary survey was requested to prepare blank forms, suitable for such a survey, to be sent as samples to the different cities and villages in the State. The following resolution was adopted:—

Resolved, That the Michigan State Board of Health earnestly recommend to the boards of health of the cities and villages, that they make a sanitary survey of the territory under their jurisdiction, on blanks of which a sample is sent herewith, and to adopt such measures as the sanitary surveys may prove to be necessary to place the cities and villages in a good sanitary condition.

The Board proceeded to the election of President for the ensuing two years, which resulted in the reëlection of Dr. John Avery, of Greenville.

It was voted that, hereafter, the health officers of villages, as well as of cities, be requested, under the law, to make to this Board weekly reports of sickness under their observation.

The Secretary was authorized to print and distribute a revised edition of the document (No. 64) relative to the duties of health officers and local boards of health. [It has been revised and issued as No. 86.]

The text-book by William Thayer Smith, "The Human Body and its Health," was approved by the Board, under the law, and the following were approved conditionally: "Practical Work in the School-Room," published by A. Lovell & Co., and "The Essentials of Anatomy, Physiology and Hygiene, a text-book for Schools and Academies," published by D. Appleton & Co.

Dr. Vaughan reported that he had examined the three samples of wall paper, sent by Rev. J. K. Close, of Bronson, Mich., and referred by the Board at its last meeting to him. The papers had been sent for examination, because sickness of persons who occupied the rooms on the walls of which the paper was, had been attributed to the wall paper. Dr. Vaughan found that each specimen contained arsenic.

Dr. Vaughan reported that, by invitation, he had visited Grand Rapids to attend the meeting of the State Dairyman's Association, and had given the Association a talk on cheese-poisoning. The Secretary then read, from a Grand Rapids newspaper, a resolution which had been adopted by the State Dairyman's Association, thanking Prof. Vaughan for his address, and the State Board of Health for paying his expenses in attending the meeting.

SPECIAL MEETING AT TRAVERSE CITY, JUNE 3 AND 4, 1885.

Present: John Avery, M. D., President; Drs. Kellogg, Hazlewood and Baker.

This meeting was called for the purpose of examining plans for the heating, plumbing, and sewerage of the Northern Asylum for the Insane, and for the transaction of such other business as might properly come before the Board at that time. The plans for the Northern Asylum for the Insane were examined. [For report in regard to this examination, see pages 177–180].

Plans were submitted to the Board for a proposed hospital at the State Reform School at Lansing, but they were found to be insufficient for the purposes of the Board in arriving at a decision, from a sanitary point of view, as to the fitness or unfitness of the proposed building for the purposes for which it is designed. [See page 180].

Plans for a proposed Infirmary for males at the Michigan Asylum for the Insane, at Kalamazoo, were submitted, but were also insufficient. [See pages 180–181].

SPECIAL MEETING HELD AT YPSILANTI JULY 1, 1885.

Present: John Avery, M. D., President; Drs. Lyster, Kellogg, Vaughan, and Baker.

This meeting was held at the time of the sanitary convention at Ypsilanti, which was under the auspices of the Board.

After the auditing of bills, the Board adjourned.

REGULAR QUARTERLY MEETING AT LANSING, JULY 14, 1885.

Present: John Avery, M. D., President; Drs. Lyster, Tyler, Hazlewood and Baker.

The subject of a systematic sanitary survey of the State was again brought up; and the committee on sanitary survey was given further time in which to perfect a plan.

The Secretary brought up the subject of the investigation of the office of the Board by a committee of the house of representatives. He thought that the Board should make such a thorough examination of the office, and of everything relating to the work of the office, as to be able to say that its examination was much more thorough than could well be made by outside persons. Action was postponed until the afternoon.

Afternoon Session.

Plans for a double cottage at the State Reform School were submitted to the Board for examination, under the law, and were explained by William Appleyard, architect. [An account of the examination is printed on pages 181–182.]

The Secretary read a summary of public health legislation in 1885. [It is printed on page 174.]

The Secretary presented a printed statement relative to the investigation of the office by a committee of the House of Representatives. He asked the appointment of a committee of the Board to whom it should be referred, and by whom an investigation should be made. He was requested to read his statement, and did so. Drs. Hazlewood, Vaughan and Tyler were then appointed a committee to investigate the office.

The Secretary then presented and read Act No. 230, Laws of 1885: "An Act to provide for the prevention of the introduction and spread of cholera and other dangerous communicable diseases." Drs. Baker and Lyster were appointed a committee to frame rules required by that act to be framed and published by the Board.

The Secretary asked if the Board would instruct him in advance as to what he should do on an outbreak of cholera in Michigan. It was voted that if cholera appears in Michigan, the Secretary should go at once and confer with the local authorities to stamp out the disease, or send some competent person to do so.

Dr. Vaughan suggested that if cholera should appear anywhere in North America, the President call a meeting of the Board.

The document of the Board, on Prevention of Cholera, was referred to

Drs. Baker and Lyster for revision, and 20,000 copies were ordered printed for distribution.

It was voted that the names and addresses of the health officers in Michigan be printed and distributed.

The Secretary was authorized to print and use a circular letter relative to typhoid fever, designed to collect information bearing upon the period of incubation, modes of spread, etc., and to transmit documents suggesting the disinfection of discharges from the bowels of patients, and a faithful guarding of the water-supply.

The subject of issuing a document on the restriction of typhoid fever, as recommended by the Secretary, was referred to Drs. Baker and Lyster, with power to act, including the decision of the number to be printed.

A proposed circular to local boards of health relative to the prevention of the introduction of contagious diseases, and the removal of bodies dead from contagious diseases, was submitted by the Secretary; also an abstract of it relating only to the removal of dead bodies, entitled, "Permits for the Removal of Sick Persons or Infected Articles." The Secretary was authorized to print and circulate them. [The entire circular is printed on pages 183–190.]

Invitations from Dr. J. Tripp, of Adrian, Dr. S. S. C. Phippen, of Owosso, and Hon. Wm. McPherson, Jr., of Howell, to hold sanitary conventions at their respective places, were presented. The committee of the Board was directed to visit Adrian and Howell, whenever local committees of citizens were ready for a conference, for the purpose of making necessary arrangements. Action on the invitation from Owosso was postponed.

SPECIAL MEETING HELD AT LANSING, SEPT. 22, 1885.

Present: John Avery, M. D., President; Drs. Hazlewood, Kellogg, Tyler, Vaughan and Baker.

This meeting was for the purpose of establishing a health inspection of travel at Detroit and Port Huron, under act No. 230, Laws of 1885, to guard the State from the introduction of small-pox from Montreal, Canada, where that disease was then raging.

The meeting was mostly taken up by the discussion of rules and regulations for the government of such inspection, the appointment of inspectors, and the passage of resolutions relating to the subject. [As finally adopted, the rules and regulations are printed on pages 207–209.]

[For other action of the Board in regard to the inspection service, see the article on that subject, pages 196–217.]

Dr. Hazlewood, chairman of the committee to investigate the Secretary and the affairs of the office of the Board, read the report of the committee. Action upon the subject was deferred until the regular meeting of the Board October 13, 1885.

ABSTRACTS OF QUARTERLY REPORTS PRESENTED BY THE SECRETARY AT REGULAR MEETINGS OF THE BOARD, OF WORK DONE IN THE OFFICE OF THE STATE BOARD OF HEALTH.

QUARTER ENDING OCTOBER 7, 1884.

An abstract of the proceedings of the July meeting was made and sent to about fifty sanitary journals and exchanges. A large amount of tabular work on meteorology for the next Annual Report (1884) has been prepared for publication. The Annual Report for 1883 has been received from the printers and about six hundred and fifty copies have been distributed by mail.

A document on Prevention and Restriction of Cholera was prepared, as directed at the last meeting. Twelve thousand copies were printed, and all except about eighty have been distributed. At the request of Gen. W. P. Innes, the commissioner of railroads, the material for a circular on cholera in its relations to railroads was also prepared and transmitted to him. This was published and distributed by that officer to all railroads in Michigan, with the request that its directions be carried out by the railroad officials.

The proceedings of the Hillsdale Sanitary Convention have been edited, sent to the printers, proof read on the same, copies of the document received, and a considerable number of copies distributed.

The document on "The Prevention and Restrction of Diphtheria," ordered re-printed at the last meeting has been revised, and twenty thousand copies printed.

Five thousand copies of the compilation of the Public Health Laws have been received from the printers, and a copy has been sent to each of the correspondents of this Board, and to every health officer in the State—a class of persons who do not receive the Session Laws. Where no health officer was appointed, a copy was sent to the president of each board of health.

A list of the names and addresses of the health officers of Michigan has been prepared; one thousand eight hundred copies printed and every local board of health has been supplied with a copy.

Large distributions of various other circulars and reprints have been made to sanitary journals and exchanges, to correspondents and Sanitariums, in this and other states, and to mayors of cities, presidents of villages, supervisors of townships, and to health officers, especially of documents on contagious diseases, to localities in which the disease was reported.

The State has been free from small-pox during this quarter. Glanders was reported in townships in Delta county, Upper Peninsula, among stage horses and in the lumber camps. Prompt and continued correspondence with the local boards of health led to the destruction of two of the diseased horses by their owner.

Three additional outbreaks of poisoning from eating cheese have been reported, the last one reported being at Lowell, Mich. Correspondence on the subject has been continued. Some of this cheese was sent to Prof. V. C. Vaughan, of the State University, and some to Prof. T. J. Burrill, of Illinois State Industrial School, for examination and experiment.

The correspondence of the office during the quarter, exclusive of postals, not copied, covers 687 pages of letter book.

A study has been made of the evidence collected in the office bearing upon the causation of pneumonia; and material is on hand and in *mind*, which, in the opinion of the Secretary, will serve to explain the causation of that disease. Time has not yet been found, however, to prepare the paper.

QUARTER ENDING JANUARY 13, 1885.

The Secretary mentioned that during the quarter a successful sanitary convention had been held in East Saginaw, and that steps had been taken by citizens of Lansing to hold a sanitary convention in Lansing, in March next (March 19 and 20, 1885). The Secretary had attended, as delegate of the Board, two meetings of the Conference of State Boards of Health, one in St. Louis, Mo., in October, and one in Washington, D. C., in December. In the former he was chairman of the committee which prepared the report on practical means of preventing the introduction and spread of cholera in this country, which was adopted by the Conference, and also by the American Public Health Association. It has been widely published. In the Conference at Washington he read a report on the sanitary condition of Michigan, and preparations made for meeting the threatened invasion by cholera, and was a member of the committee on best methods of action by the National Government to prevent the introduction and spread of cholera.

Bound volumes of the Annual Report for the year 1883 had been received from the printers, and this and other documents have been mailed to all health officers in the State, to clerks of cities and of villages, and to mayors of cities and presidents of villages. A large number of circulars, in English and in foreign languages, on best means of restricting and preventing certain communicable diseases, had been sent to health officers where contagious diseases were present. A large number of Annual Reports, reprints and circulars have been sent to persons interested in sanitary affairs. Blanks for reports of diseases dangerous to public health, with circular of instructions, were sent to all health officers of cities, villages and townships in the State, to the number of 1,390. Another set, for reporting communicable diseases in 1884, was sent to the clerks of cities, villages and townships in Michigan. Two copies of a circular relative to diseases in Michigan in the year 1884, and stamped envelope for reply, have been sent to about one hundred and eighty physicians in Michigan, who are regular correspondents of the Board.

QUARTER ENDING APRIL 14, 1885.

Of the 760 pages of copied letters sent out, 153 pages were modified circular letters to local health officers, in regard to prompt action to restrict contagious diseases. In connection with those, about ten thousand copies of the documents on the restriction and prevention of certain contagious diseases, and on the duties of health officers, have been sent to health officers for distribution to neighbors of families in which such contagious diseases have been reported. Since the last meeting of the Board, the outbreak of small-pox at South Boardman had been suppressed. During the past quarter there had been one case of small-pox at East Saginaw, two cases in Grand Rapids (confined to one house), the first of which was a commercial traveler, who thinks he was exposed on the train between Boston and Grand Rapids. About the time he was exposed, it is known that a man having small-pox passed through Michigan, on the Michigan Central railroad, from Ontario to Chicago, *en route* for Manitoba. At Battle Creek there have been four cases, with one death, from small-pox, the contagium of which is supposed to have come from a brakeman on the Chicago and Grand Trunk railroad, who stopped with a family in Battle Creek while he was slightly sick, and who thinks he contracted the disease on the train near Chicago. Two members of this family in Battle Creek visited friends in Bellevue, in Eaton county, and small-pox broke out in the family in which they stopped. Five cases and one death have occurred there; but thus far the disease at Bellevue has been confined to the one family. All the members of the family were vaccinated with virus on points from Fond du Lac, Wisconsin, as soon as it was known they had been exposed; but in three cases the vaccination did not work. In one case in which the vaccination worked, the person has shown no symptoms of the disease.

At the last meeting of the Board, the subject of proposed legislation relative to diseased animals, and relative to a standard for milk, had been referred to the committee on legislation and diseases of animals jointly. The secretary reported considerable time and care had been devoted to the perfecting of three bills relating to those subjects, which had been introduced into the house of representatives this session.

QUARTER ENDING JULY 14, 1885.

The weekly and monthly bulletins of health in Michigan, and the meteorology and mortality reports had been prepared from the numerous reports received and sent out as heretofore. The footings and computations on meteorological registers and on the sickness reports and tables have been carried on; and the meteorological computations for the year 1884 nearly completed ready for tabulation. The office had made large distributions of documents relative to the work of health officers, and to the restriction of contagious diseases, to newly appointed health officers, and to others, especially in localities where such diseases have occurred. The proceedings of the Sanitary Convention at Lansing have been edited, sent to the printer, and the proof on most of it read. Articles on meteorology and sickness in Michigan in 1883 have been completed from data previously collected. Data collected by the office relative to scarlet fever in Michigan in 1884 have been compiled, and also that relative to diphtheria. A map has been prepared showing the distribution of diphtheria in Michigan in 1884. Small-pox has been present in Michigan during the quarter, at Bellevue, Eaton county; Alba, Antrim county; Battle Creek; Girard township, Branch county, and South Haven. The outbreak at South Haven was confined to those first exposed, and has been stamped out after nine cases occurred with one death. The infection at South Haven was from a German immigrant who sailed from Bremen, April 12, on the ship Donau, North German Lloyd line. The immigrant was broken out with small-pox when he reached South Haven, April 27, and might have been quarantined *en route*, and the outbreak thus confined to the one case. All infected persons were at once vaccinated by the health officer; but the virus was not good, and thus precious time was lost. This outbreak is but another added to the many constantly recurring outbreaks of communicable diseases in Michigan and the Northwest, to which a faithfully executed immigrant inspection service, carried on by the National Government, would put an end, or greatly lessen. At the present time, so far as known, there is not a case of small-pox in Michigan. Typhus fever was reported at Grand Rapids, Mich., during the week ending July 4.

[It turned out to be only typhoid fever.] Cholera is spreading with great violence in Mediterranean Spain, hundreds dying daily. It was reported present in Marseilles over a month ago, and July 10 at Toulon. A strange and fatal disease, believed to be cholera, was also reported from Portugal. Asiatic cholera will probably reach this country this year, or next year, and the State Board of Health has prepared to meet the emergency by many lines of work, as best it could. About 12,00 copies of the document on the best method for the prevention and restriction of cholera were distributed to the people last year. The recent distribution of documents relative to typhoid fever, and especially the correspondence with health officers throughout many parts of the State on the best methods of restricting this disease, has done something in the way of drill in the two important methods applicable, in case of cholera—the disinfection of all bowel discharges, and the protection of the purity of the water-supply. Much, however, remains to be done in many localities in the way of abating nuisances, and in protecting wells from sources of contamination. The legislature has passed an act granting to the State Board of Health power to establish a system of inspection of immigrants and travelers, and the disinfection of baggage, etc., liable to be infected with cholera, or other dangerous communicable disease; but the act was not given immediate effect, and so does not take effect until Sept. 18, 1885. The contingent appropriation to enable the Board to carry on the inspection, etc., provided for in the act, can be used on and after Sept. 18, in case the Governor thinks its use is necessary. Reports relative to examinations during this quarter, by this Board, of plans for buildings, have been sent to the boards governing the Michigan Asylum for the Insane at Kalamazoo, the Northern Asylum for the Insane at Traverse City, and the State Reform School at Lansing. Over 650 pages of the letter book have been used in copying the most important parts of the correspondence, and other branches of the office work have been large during the quarter, and the legislature made additional demands upon the time of the office.

A very successful sanitary convention was held during the quarter at Ypsilanti.

SPECIAL REPORTS, COMMUNICATIONS, ETC.

A summary of certain reports relative to certain communicable diseases, is printed on pages 227–282.

This thirteenth Annual Report is respectfully submitted.

HENRY B. BAKER,
Secretary.

PRINCIPAL METEOROLOGICAL CONDITIONS IN MICHIGAN IN 1884.*

A COMPILATION OF REPORTS BY OBSERVERS FOR THE STATE BOARD OF HEALTH AND FOR THE UNITED STATES SIGNAL SERVICE.

BY THE SECRETARY OF THE STATE BOARD OF HEALTH.

For each of the years 1877 to 1883, inclusive, there has been published in the Annual Reports of this Board a summary relative to the principal meteorological conditions as observed for the year. This paper continues the subject for the year 1884. The names of the observers for 1884 and the months for which copies of their registers of meteorological conditions were received from each are stated in Exhibit 1, page 6. In Exhibit 2, page 7, is given the latitude, longitude, and elevation of each station. In the tables which follow, reports received from any observer for less than a full year have not been used.

The principal conditions treated in the following tables are temperature and humidity of the air, cloudiness, rainfall, ozone, velocity and direction of the wind, and pressure of the atmosphere. The tables on each subject are illustrated by diagrams representing to the eye variations in the given condition from month to month through the year, at the several localities represented.

These tables give not only meteorological conditions for the year and month under consideration, but they also contain, for purposes of comparison, statements of the average conditions for the longest period available in each case.

Many uses of meteorological statistics are recognized in an indefinite way, though the extent to which they are required is not generally appreciated. In laying out the sewers and drains of a city or village it is necessary to know the average rainfall and the greatest single rainfall in the given locality in order properly to provide for the sizes of conduits, etc. Carefully prepared meteorological data are frequently of use to the farmer as knowledge of the weather is to the seaman. Thus each class of persons has its own uses for such information, and the data in this article are presented for such use as may be desired, yet the main purpose of the collection and compilation is their use in learning the causes of diseases.

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*An article in this Report, based upon weekly reports of sickness in Michigan, may well be studied in connection with this article, the main purpose of which is to serve as bases for studies of the causes of diseases.

SOME OF THE USES OF METEOROLOGICAL STATISTICS IN STUDYING THE CAUSATION OF DISEASES.

The relations between meteorology and disease has been a subject of speculation among the philosophers of all ages. Hippocrates said that a study of meteorological phenomena was requisite to the proper understanding of medicine. He himself attempted to trace the effects of heat and direction of wind, etc., on disease. Aristotle wrote a treatise on meteorology, and the Romans sought health resorts on the Mediterranean, though they did not study the subject from a scientific standpoint.

Notwithstanding its long acknowledged importance to humanity, medical climatology as a science is still, however, in its infancy. It is only lately that correct *mortality* statistics have been accessible, and data concerning *sickness* are still very incomplete. If exact data from all parts of the world are wanting, and if on this account only dim outlines are seen, so much the greater is the reason for pushing these observations wherever practicable, in order that these relations may be given distinct outlines.

Relative to one of these meteorological conditions, namely, ozone, concerning the influence of which the outlines are least distinct, Daniel Draper, Ph. D., Director New York Meteorological Observatory, writing concerning a very fatal epidemic of pneumonia in the city of New York, after stating that a comparison of other observations from the barometer, thermometer, etc., with the mortuary statistics showed no connection with the prevalence of pneumonia, but that ozone showed a very close connection with the death-rate from this disease, continues: "I regret to see that so many meteorologists neglect taking ozone observations, because they are not satisfied with the results obtained. I think that the day is not far distant when we shall know the exact influence of ozone upon disease."*

Andrew H. Smith, M. D., in the Medical Record (quoted in the Scientific American Supplement, Oct. 24, 1885,) speaking of "A Method of Producing Ozone in Large Quantities," states that the air when highly charged with ozone if breathed incautiously "excites cough and produces a disagreeable irritation along the respiratory tract, and especially at the bifurcation of the trachea, which irritation may continue for several hours. Persistence in the inhalation would no doubt be followed by congestion or inflammation of the bronchial membrane."

Henry Day, M. D., F. R. C. P., in an address delivered before the Congress of the Sanitary Institute of Great Britian at Stafford, October, 1878, speaking of a series of experiments with warm-blooded animals "placed in a glass chamber" and "subjected to a stream of ozonized air," and of a certain order of symptoms observed, said: "If an animal be killed during the first stage, the bronchial membrane will be found to be dry, deeply congested at spots, the lung structure being ecchymosed and both sides of the heart full of blood. In the second stage the whole lung is congested, and the bronchial surface being red, the right side of the heart engorged, the left side of the heart empty. In the third stage the lungs are also intensely engorged, the bronchial surface paler and filled with frothy fluid, the right side of the heart full, the left side empty. In cases where animals are removed from the chamber at the beginning of the second stage, and, after some exposure to the air, subsequently die, the morbid anatomy is rather that of pneumonia than bronchitis."

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*Am. Meteorological Journal, Sept. 1, 1885.

Filipow, from a series of experiments with ozone on men and dogs (Pflüger's Archiv, Band XXXIV, seite 335; conclusions summed up in the Physician and Surgeon, April, 1885, page 189) concludes that "Respiration in concentrated ozone produces powerful irritation of the mucous membrane."

Hiram A. Cutting, A. M., M. D., State Geologist, Vermont, in an address delivered at the fifty-third Annual Meeting of the White Mountain Medical Society, (Vermont Medical Journal, March, 1874, page 68) states that "when following up experiments upon ozone for some days I had an attack akin to pneumonia which came near being serious."

If such is the action of artificially prepared ozone, how important that statistics of atmospheric ozone be gathered for comparison with the sickness and mortality from the acute respiratory diseases. For several years Michigan was the only State in the Union where systematic observations of ozone were taken.

The effects of other meteorological conditions than ozone, such as the variations of the temperature, humidity, rainfall, etc., are probably more important, and are little better understood.

Besides those important questions relating to the most common meteorological conditions, there are other questions which mankind ought to be able to answer, such as: Are neuralgic pains experienced before a storm? What are their relations to atmospheric electricity and to barometric pressure? Is ozone an active agent in promoting health or in causing disease or is it only concomitant with other conditions that cause disease? Is a high barometer followed by a high death-rate from consumption? Is a high altitude preventive of consumption? What are the effects of the electrical condition of the atmosphere, of ozone and of moisture on the prevalence of yellow fever.[*] Is it true, as alleged, that cholera thrives best in a very dry climate, while yellow fever requires a moist atmosphere, and that for these reasons these diseases never co-exist.[†] Why does yellow fever disappear with a frost? Are exhalations from the earth the direct cause of malarial or intermittent fever, or only a condition having no causative relation,—the damp soil affording a less equable day and night temperature? What relations do barometric fluctuations bear to intermittent fever? Why do the great plagues follow in the footsteps of a drought? Does dysentery disappear with heavy rains? If so, why? Why is typhoid fever concomitant with low water in wells? Why does cholera, as shown from statistics taken from a long series of years, reach its maximum in periods following those in which there is little rainfall, and sink to its minimum after heavy rains? What is the effect of the ground air on the prevalence of cholera and typhoid fever, or has it no effect whatever? What diseases are consequent upon meteorological conditions? What are those conditions? Most of these questions rest on data yet to be grouped in accordance with the scientific method; a few have already been settled, but only provisionally; others are propositions which will probably be set aside through a thorough study of more accurate data; but all are intimately connected with our well-being, and, if man is to use his intelligence to secure the most complete and comfortable existence, these questions are of vital interest to every citizen. Some of these questions might probably be answered by the systematic collection of facts in a single State, such as Michigan.

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[*] No systematic observations of ozone have ever been taken during yellow fever epidemics; and if there had been there is no record of systematic observations of ozone in the same localities at such times as there was no yellow fever, with which to compare the epidemic season.

[†] American Meteorological Journal, December, 1885, page 361.

REASONS WHY SO LITTLE IS KNOWN OF THE METEOROLOGICAL CAUSES OF DISEASES.

The saying that "what is every man's business is no man's business" is old and familiar, and the evils which come from the neglect of public duties because of private interests continue to be endured without great effort for general advancement. For the formation of the science of the causation of diseases the records of many observers are needed; and few persons have sufficient spirit of self-sacrifice to contribute their time and energies for the public good without compensation. There is also a belief, which seems to be growing, that it is as wrong for the State to "get something for nothing" as it is for the individual to do the same. This often makes it difficult, for those who try to study the relations of deaths and of sickness to meteorological conditions, to obtain the data essential to such a study. Frequently the deaths are not recorded because the law does not provide that those who know of them shall immediately record them; sickness reports are not made by local health officers because the local officer can get no compensation; meteorological observations are not made, or, if made, are not reported, because the observer can get no pay, even for the time employed in copying his register for public uses.

The necessary records upon which must be based scientific knowledge of the causes of diseases can not generally be had continuously unless the people are so enlightened as to make provision for compensation to those who supply such records and to those who shall employ their time and their best energies in grouping the evidences to be derived from such records. Physicians and meteorological observers who contribute the results of their observations for the public good should undoubtedly receive a money compensation, in addition to that which every man experiences in such philanthropical work; but this is not generally done; and perhaps the best that is done in any State is done in Michigan, where the State has made ample provision for the collation and publication of such data, and where, consequently, all who contribute continuous reports can receive in return the published results carefully compiled, together with the results contributed by every other observer in the State.

The principle of "what is every man's business is no man's business" is as true of the representatives of a people as it is of the people themselves. In this country legislators are elected by the people, to represent the people; and the theory is that a legislator represents the district which elects him. The result is that when assembled the legislature is a body of men representing local interests; and as they are almost uniformly true to those local interests, the great bulk of legislation is of local interest only. This is shown by a comparison of the published volumes; the one containing the "Local acts" usually containing more pages of local laws than are covered by so-called "Public acts" in the volume for such laws. Besides this, it is well known that a large portion of the general laws are passed through the influence of local interests. There are no legislators elected by the whole people, and charged with the duty of representing the highest interests of the whole people. Excepting the Governor even those other officers elected by the entire people of a State have no legitimate influence in legislation. In our mode of State government there is at present a want of recognition of the principle that the general interests of all the people need the watchful care of legislators specially elected to represent and to guard them from those who are chosen to represent local interests. There is, then, no wonder that so little has been done in this country for the general advancement of the human race through systematic scientific work. That work can only be rapidly pushed forward by the coöperation of all classes of people, and most rapidly by the coöperation of all the people, by such a general even though small sacrifice of individual time or money as can most equitably be done through general laws enacted by the legislature.

But however slow is the progress in sanitary climatology throughout the United States, in Michigan within the last ten years it has been remarkable, and at the present time there is no State in this Union where so much in this direction has been accomplished through wise and public-spirited legislation, and especially through the public spirit of physicians and meteorological observers, as has been accomplished in Michigan.

For several years the Michigan State Board of Health has had a number of meteorological observers in different parts of the State, taking observations three times a day; and some of them are supplied with registering instruments which make continuous records. The Board has also had from many different parts of the State weekly reports of the sickness which has occurred, so that there is no State in the Union, and probably no such area in the world, concerning which the relations which the health of the inhabitants bears to the climate can be written about and studied with reference to the exact facts, so thoroughly as can be done for the State of Michigan.

There is one important fact which has been made much clearer by the systematic studies of the climatic causes of sickness, which have been carried on by the Michigan State Board of Health; and that is that some of those diseases which cause the most sickness, and which are most closely related to climatic conditions can be almost wholly controlled by intelligent communities. There is now, for instance, no longer any necessity for permitting a "Green Christmas" to make a "fat churchyard," because it has been pointed out* that the typhoid fever which follows on an "open winter" is probably due to the decomposing organic filth which should be, but has not been, kept out of wells which supply drinking water. The causation of pneumonia also has been quite thoroughly studied, and while it may not be possible to change the out-door conditions which are causative of pneumonia, it is frequently possible to avoid exposure to such conditions; and a large proportion of the time of most people is spent indoors where we can control the temperature and other conditions which probably cause that disease.

But for any effective efforts for the avoidance or control of the causes of diseases, knowledge of the nature, extent, and sources of those causes is essential. It is sincerely hoped that this year's contribution to the meteorological data for this State may be found useful in many ways, and for many years, even for all time to come.

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* Page 100, Report Michigan State Board of Health, 1884.

EXHIBIT 1.—*Names of observers whose Reports are summarized in the following Meteorological Tables and Diagrams, their Places of Observation, and the Counties and Geographical Divisions of the State in which these Places are situated, and months for which reports were received from each observer.*

Name of Observer.	Place of Observation.	County.	Divisions of the State.*	Months (inclusive) for which Registers were Received.
J. Gilligan, Sergeant Signal Corps, U. S. A.	Marquette	Marquette	U. P.	Jan. to Apr.
F. M. Neal, Sergeant Signal Corps, U. S. A.	Marquette	Marquette	U. P.	May to Dec.
Arthur Beebe	Manistique	Schoolcraft	U. P.	Jan. to Dec.
L. M. Pindell, Sergt. Signal Corps, U. S. A.	Escanaba	Delta	U. P.	Jan. to Dec.
G. H. Cleveland, M. D.	Moorestown	Missaukee	N. W.	Dec.
S. E. Wait	Traverse City	Gr. Traverse	N. W.	Jan. to Dec.
A. W. Nicholson, M. D.	Boyne City	Charlevoix	N.	Nov. and Dec.
D. B. Notson, Sergt. Signal Corps, U. S. A.	Mackinaw City	Cheboygan	N.	Jan. to Dec.
James J. Fitzgerald, Sergt. Signal Corps, U. S. A.	Alpena	Alpena	N. E.	Jan. to Dec.
D. W. Mitchell, M. D.	Harrisville	Alpena	N. E.	Apr. to Dec.
Joseph E. Mueller, Sergt. Signal Corps, U. S. A.	Grand Haven	Ottawa	W.	Jan. to Dec.
Fred Sweet	Grand Rapids	Kent	W.	Jan. to Mar. and May.
E. S. Richardson, M. D.	Reed City	Osceola	W.	Jan. to Dec.
C. E. Swift	Lexington	Sanilac	B. & E.	Jan. to May.
Marcus H. Norman	Lexington	Sanilac	B. & E.	June to Sept.
J. W. Kimball	Port Austin	Huron	B. & E.	Jan. to Dec.
M. H. Perry, Sergeant Signal Corps, U. S. A.	Port Huron	St. Clair	B. & E.	Jan. to Dec.
John S. Caulkins, M. D.	Thornville	Lapeer	B. & E.	Jan. to Dec.
Prof. R. C. Kedzie	Agricult'l College, near Lansing	Ingham	C.	Jan. to Dec.
Rev. J. Pierson, D. D.	Ionia	Ionia	C.	Jan. to Dec.
E. J. Rauchfuss	Office State B'd of Health, Lansing	Ingham	C.	Jan. to Feb. 22.
Harry B. Turner	Office State B'd of Health, Lansing	Ingham	C.	Feb. 22 to Aug.
Howard M. Holmes	Office State B'd of Health, Lansing	Ingham	C.	Sept. to Dec.
G. G. Gordon, M. D.	Swartz Creek	Genesee	C.	Jan. to Dec.
Lee S. Cobb	Winfield	Ingham	C.	Jan. to Oct.
Prof. M. W. Harrington	University of Michigan, Ann Arbor	Washtenaw	S. C.	Jan. to Dec.
J. H. Kellogg, M. D.	Battle Creek	Calhoun	S. C.	Jan. to Dec.
F. D. Parmelee	Hillsdale	Hillsdale	S. C.	Jan. to Dec.
Lieut. A. H. Boies, Hudson	Hudson	Lenawee	S. C.	Jan., Feb., & May to Dec.
Geo. C. Palmer, M. D. Supt.	Asylum for Insane, Kalamazoo	Kalamazoo	S. C.	Jan. to Dec.
W. T. Drake	Marshall	Calhoun	S. C.	Jan. to Dec.
C. W. Shepard, M. D.	Mendon	St. Joseph	S. C.	Jan. to Sept.
Lewis Marvill	Parkville	St. Joseph	S. C.	Jan. to Dec.
L. G. North, M. D.	Tecumseh	Lenawee	S. C.	Jan. to Dec.
Norman B. Conger, Sergeant Signal Corps, U. S. A.	Detroit	Wayne	S. E.	Jan. to Dec.
Albert Yates, M. D.	Washington	Macomb	S. E.	Jan.

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* The counties in each division are stated in Exhibit 1, in the article on weekly reports of sickness.

EXHIBIT 2.—*Latitude and Longtitude, Elevation above Sea Level, and the Average Temperature, and Average Barometric Pressure in 1884, at 26 Meteorological Stations in Michigan—the names of the Stations being arranged in order by latitude, highest first.*

Localities in order of Latitude,—those farthest North, first.	Latitude North.	Longitude West from Greenwich.	Altitude (Approximate) above Sea Level,—Feet.	Height of Mercury in Cistern of Barometer above Sea Level,—Feet.	Average Temperature, 1884. Degrees Fahr.	Average Atmospheric Pressure, 1884. Inches of Mercury corrected for Temp.
Marquette	46°33′	87°36′	638.07	673.	39.03	29.270
Manistique	45°58′	86°15′	611.	616.	40.39	29.327
Mackinaw City	45°47′	84°39′	582.	605.	40.65	29.339
Escanaba	45°46′	87°14′	594.693	615.193	39.23	29.327
Alpena	45°5′	83°28′	587.9	609.5	40.43	29.323
Traverse City	44°45′	85°40′	598.	602.5	42.91	29.341
Harrisville	44°30′	83°18′	....	....	....	....
Port Austin	44°	82°	478.	....	44.15	29.363
Reed City	43°44′	85°28′	1,016.	1,022.	43.15	28.869
Grand Haven	43°5′	86°18′	595.3	616.3	46.94	29.341
Swartz Creek	43°	83°5′	....	....	45.48	....
Ionia	[†] 42°59′	[†] 85°4′	688.1	700.	45.66	29.294
Port Huron	42°58′	82°29′	600.	630.	44.43	29.301
Thornville	[*] 42°55′	[*] 83°12′	[‖] 975.	980.	47.74	28.970
Agricultural College	42°44′	84°29′	820.	834.	45.66	29.087
Lansing	[‡] 42°44′	[‡] 84°33′	[a] 900.	[a] 917.	47.43	29.087
Washington	42°40′	83°	746.33	752.33	....	....
Winfield	[*] 42°30′	[*] 84°34′	....	....	....	....
Detroit	42°20′	83°2′	602.6	661.43	49.71	29.315
Battle Creek	[*] 42°20′	[*] 85°11′	[§] 800.	....	49.30	....
Kalamazoo	42°18′	85°35′	975.	987.	47.36	28.971
Ann Arbor	42°17′	83°44′	930.	936.	45.56	29.030
Marshall	42°17′	84°58′	885.	888.	48.63	29.038
Mendon	[*] 42°2′	[*] 85°29′	[§] 871.	....	....	....
Tecumseh	[*] 42°1′	[*] 83°57′	835.	837.5	47.05	29.135
Hillsdale	[¶] 41°55′	[¶] 84°34′	[§] 1,139.	....	47.01	28.808

[*] Estimated from lines on a map of Michigan issued by the General Land Office, Department of the Interior, 1878. For stations having no reference mark, the latitude and longitude were stated by the observer on the meteorological reports received.

[†] The exact latitude and longtitude of the astronomical post at Ionia is 42°58′ 52.53″ N. and 85°3′ 49.20″ W.

[‡] The exact latitude and longitude of the astronomical post placed in the ground near the new Capitol at Lansing, by the U. S. Lake Survey in 1875, as determined by the observations then made, is 42°43′ 53.11″ N. and 84°33′ 19.68″ W.

[§] Estimated from data on "Railroad Profiles," pages 179-187, Annual Report of the State Board of Health for 1878.

[‖] Estimated from data in Tackabury's Atlas of the State of Michigan.

[¶] By table in Tackabury's Atlas of Michigan.

[a] Estimated from comparisons of barometrical observations at Lansing, Port Huron, and Grand Haven, for the four years 1879-82.

NOTE.—Green's standard barometer was used at the above stations for the year 1884, Kalamazoo excepted. The barometer at Kalamazoo was manufactured by J. Foster, Cincinnati, Ohio.

METEOROLOGICAL CHARACTERISTICS OF EACH MONTH OF THE YEAR 1884, AS SHOWN BY AVERAGES FOR MANY STATIONS IN MICHIGAN.

JANUARY, 1884.

TEMPERATURE.—The average temperature for January was 6.29° lower than the average for that month for the 8 years, 1877-84, and 0.64° lower than the average for January, 1883, as shown by Exhibit 5, page 26. The average of the daily range of temperature for January was 1.05° greater than the average for that month for the 6 years, 1879-84, and 0.08° greater than for January, 1883, as shown by Exhibit 8.

ABSOLUTE HUMIDITY (GRAINS OF VAPOR OF WATER IN A CUBIC FOOT OF AIR).—The average for the month was 0.32 of a grain less than the average for January, for the 8 years, 1877-84, and 0.02 of a grain less than for January, 1883, as shown by Exhibit 11.

RELATIVE HUMIDITY (PER CENT. OF SATURATION OF THE ATMOSPHERE).—The average for January was 1 per cent. less than the average for that month for the 7 years, 1878-84, and 2 per cent. less than the average for January, 1883, as shown by Exhibit 13.

CLOUDINESS.—The average per cent. of cloudiness for January was 5 per cent. greater than the average for that month for the 8 years, 1877-84, and 4 per cent. greater than for January, 1883, as shown by Exhibit 18.

RAINFALL.—The rainfall and melted snow for January was 0.15 of an inch greater than the average for that month for the 8 years, 1877-84, and 0.15 of an inch greater than for January, 1883, as shown by Exhibit 22.

OZONE (DAY).—The average amount of atmospheric ozone by day for January was 0.03 of a degree less than the average for that month for the 8 years, 1877-84, and 0.47 of a degree less than the average for January, 1883, as shown by Exhibit 27.

OZONE (NIGHT).—The average amount of atmospheric ozone by night for January was 0.02 of a degree greater than the average for that month for the 8 years, 1877-84, and 0.57 of a degree less than the average for January, 1883, as shown by Exhibit 28.

FEBRUARY, 1884.

TEMPERATURE.—The average temperature for February was 4.66° lower than the average for that month for the 8 years, 1877-84, and 0.91° higher than the average for February, 1883, as shown by Exhibit 5, page 26. The average of the daily range of temperature for February was 0.21° greater than the average for that month for the 6 years, 1879-84, and 0.59° less than the average for February, 1883, as shown by Exhibit 8.

ABSOLUTE HUMIDITY (GRAINS OF VAPOR OF WATER IN A CUBIC FOOT OF AIR).—The average for the month was 0.22 of a grain less than the average for February for the 8 years, 1877-84, and 0.08 of a grain greater than the average for February, 1883, as shown by Exhibit 11.

RELATIVE HUMIDITY (PER CENT. OF SATURATION OF THE ATMOSPHERE).—The average for February was 3 per cent. greater than the average for that month for the 7 years, 1878-84, and 1 per cent. greater than the average for February, 1883, as shown by Exhibit 13.

CLOUDINESS.—The average per cent. of cloudiness for February was 16 per cent. greater than the average for that month for the 8 years, 1877-84, and 15 per cent. greater than the average for February, 1883, as shown by Exhibit 18.

RAINFALL.—The rainfall and melted snow for February was 0.79 of an inch greater than the average for that month for the 8 years, 1877-84, and 0.62 of an inch less than for February, 1883, as shown by Exhibit 22.

OZONE (DAY).—The average amount of atmospheric ozone by day for February was 0.21 of a degree less than the average for that month for the 8 years, 1877-84, and 0.65 of a degree less than the average for February, 1883, as shown by Exhibit 27.

OZONE (NIGHT).—The average amount of atmospheric ozone by night for February was 0.19 of a degree greater than the average for that month for the 8 years, 1877-84, and 0.25 of a degree less than the average for February, 1883, as shown by Exhibit 28.

MARCH, 1884.

TEMPERATURE.—The average temperature for March was 2.26° lower than the average for that month for the 8 years, 1877-84, and 4.15° higher than the average for March, 1883, as shown by Exhibit

5, page 26. The average daily range of temperature for March was 2.21° greater than the average for that month for the 6 years, 1879-84, and 1.56° less than the average for March, 1883, as shown by Exhibit 8.

ABSOLUTE HUMIDITY (GRAINS OF VAPOR OF WATER IN A CUBIC FOOT OF AIR).—The average for the month was 0.10 of a grain less than the average for March for the 8 years, 1877-84, and 0.38 of a grain greater than the average for March, 1883, as shown by Exhibit 11.

RELATIVE HUMIDITY (PER CENT. OF SATURATION OF THE ATMOSPHERE).—The average for March was 1 per cent. greater than the average for that month for the 7 years, 1878-84, and 2 per cent. greater than the average for March, 1883, as shown by Exhibit 13.

CLOUDINESS.—The average per cent. of cloudiness for March was 3 per cent. less than the average for that month for the 8 years, 1877-84, and 6 per cent. greater than the average for March, 1883, as shown by Exhibit 18.

RAINFALL.—The rainfall and melted snow for March was 0.23 of an inch less than the average for that month for the 8 years, 1877-84, and 1.40 inches greater than for March, 1883, as shown by Exhibit 22.

OZONE (DAY).—The average amount of atmospheric ozone by day for March was 0.50 of a degree less than the average for that month for the 8 years, 1877-84, and 0.46 of a degree less than the average for March, 1883, as shown by Exhibit 27.

OZONE (NIGHT).—The average amount of atmospheric ozone by night for March was 0.44 of a degree less than the average for that month for the 8 years, 1877-84, and 0.14 of a degree less than the average for March, 1883, as shown by Exhibit 28.

APRIL, 1884.

TEMPERATURE.—The average temperature for April was 2.48° lower than the average for that month for the 8 years, 1877-84, and 1° lower than the average for April, 1883, as shown by Exhibit 5, page 26. The average of the daily range of temperature for April was 0.27° lower than the average for that month for the 6 years, 1879-84, and 0.42° lower than the average for April, 1883, as shown by Exhibit 8.

ABSOLUTE HUMIDITY (GRAINS OF VAPOR OF WATER IN A CUBIC FOOT OF AIR).—The average for the month was 0.31 of a grain less than the average for April for the 8 years, 1877-84, and 0.13 of a grain less than the average for April, 1883, as shown by Exhibit 11.

RELATIVE HUMIDITY (PER CENT. OF SATURATION OF THE ATMOSPHERE).—The average for April was 1 per cent. less than the average for that month for the 7 years, 1878-84, and the same as the vaerage for April, 1883, as shown by Exhibit 13.

CLOUDINESS.—The average per cent. of cloudiness for April was 2 per cent. greater than the average for that month in the 8 years, 1877-84, and the same as the average for April, 1883, as shown by Exhibit 18.

RAINFALL.—The rainfall and melted snow for April was 0.38 of an inch less than the average for that month for the 8 years, 1877-84, and 0.52 of an inch greater than for April, 1883, as shown by Exhibit 22.

OZONE (DAY).—The average amount of atmospheric ozone by day for April was 0.35 of a degree less than the average for that month for the 8 years, 1877-84, and 0.40 of a degree less than the average for April, 1883, as shown by Exhibit 27.

OZONE (NIGHT).—The average amount of atmospheric ozone by night for April was 0.45 of a degree less than the average for that month for the 8 years, 1877-84, and 0.56 of a degree less than for April, 1883, as shown by Exhibit 28.

MAY, 1884.

TEMPERATURE.—The average temperature for May was 2.22° lower than the average for that month for the 8 years, 1877-84, and 3.01° higher than the average for May, 1883, as shown by Exhibit 5, page 26. The average of the daily range of temperature for April was 0.27° less than the average for that month for the 6 years, 1879-84, and 0.42° less than for April, 1883, as shown by Exhibit 8.

ABSOLUTE HUMIDITY (GRAINS OF VAPOR OF WATER IN A CUBIC FOOT OF AIR).—The average for the month was 0.18 of a grain less than the average for May in the 8 years, 1877-84, and 0.34 of a grain more than the average for May, 1883, as shown by Exhibit 11.

RELATIVE HUMIDITY (PER CENT. OF SATURATION OF THE ATMOSPHERE).—The average for May was 3 per cent. greater than the average for that month for the 7 years, 1878-84, and the same as the average for May, 1883, as shown by Exhibit 13.

CLOUDINESS.—The average per cent. of cloudiness for May was 4 per cent. greater than the average for that month for the 8 years, 1877-84, and 10 per cent. less than the average for May, 1883, as shown by Exhibit 18.

RAINFALL.—The rainfall for May was 0.39 of an inch less than the average for that month for the 8 years, 1877-84, and 2.81 inches less than for May, 1883, as shown by Exhibit 22.

OZONE (DAY).—The average amount of atmospheric ozone by day for May was 0.21 of a degree less than the average for that month for the 8 years, 1877-84, and 0.40 of a degree less than the average for May, 1883, as shown by Exhibit 27.

OZONE (NIGHT).—The average amount of atmospheric ozone by night for May was 0.01 of a degree greater than the average for that month for the 8 years, 1877-84, and 0.53 of a degree less than the average for May, 1883, as shown in Exhibit 28.

JUNE, 1884.

TEMPERATURE.—The average temperature for June was 1.50° higher than the average for that month for the 8 years, 1877-84, and 2.31° higher than the average for June, 1883, as shown by Exhibit 5, page 26. The average of the daily range of temperature for June was 1.86° greater than the average for that month for the 6 years, 1879-84, and 2.77° greater than the average for June, 1883, as shown by Exhibit 8.

ABSOLUTE HUMIDITY (GRAINS OF VAPOR OF WATER IN A CUBIC FOOT OF AIR).—The average for the month was 0.24 of a grain greater than the average for June for the 8 years, 1877-84, and 0.14 of a grain greater than the average for June, 1883, as shown by Exhibit 11.

RELATIVE HUMIDITY (PER CENT. OF SATURATION OF THE ATMOSPHERE).—The average for June was 1 per cent. greater than the average for that month for the 7 years, 1878-84, and 4 per cent less than the average for June, 1883, as shown by Exhibit 13.

CLOUDINESS.—The average per cent. of cloudiness for June was 8 per cent. less than the average for that month for the 8 years, 1877-84, and 18 per cent. less than the average for June, 1883, as shown by Exhibit 18.

RAINFALL.—The rainfall for June was 1.56 inches less than the average for that month for the 8 years, 1877-84, and 4.46 inches less than for June, 1883, as shown by Exhibit 22.

OZONE (DAY).—The average amount of atmospheric ozone by day for June was 0.28 of a degree less than the average for that month for the 8 years, 1877-84, and 0.42 of a degree less than the average for June, 1883, as shown by Exhibit 27.

OZONE (NIGHT).—The average amount of atmospheric ozone by night for June was 0.21 of a degree less that the average for that month for the 8 years, 1877-84, and 0.42 of a degree less than the average for June, 1883, as shown by Exhibit 28.

JULY, 1884.

TEMPERATURE.—The average temperature for July was 3.98° lower than the average for that month for the 8 years, 1877-84, and 1.66° lower than the average for July, 1883, as shown by Exhibit 5, page 26. The average of the daily range of temperature for July was 1° greater than the average for that month for the 6 years, 1879-84, and 1.77° greater than the average for July, 1883, as shown by Exhibit 8.

ABSOLUTE HUMIDITY (GRAINS OF VAPOR OF WATER IN A CUBIC FOOT OF AIR).—The average for the month was 0.73 of a grain less than the average for July for the 8 years, 1877-84, and 0.62 of a grain less than the average for that month for 1883, as shown by Exhibit 11.

RELATIVE HUMIDITY (PER CENT OF SATURATION OF THE ATMOSPHERE).—The average for July was 1 per cent. less than the average for that month for the 7 years, 1878-84, and 5 per cent. less than the average for July, 1883, as shown by Exhibit 13.

CLOUDINESS.—The average per cent. of cloudiness for July was 5 per cent. greater than the average for that month for the 8 years, 1877-84, and 3 per cent. less than the average for July, 1883, as shown by Exhibit 18.

Rainfall.—The rainfall for July was 0.81 of an inch less than the average for that month for the 8 years, 1877-84, and 3.11 inches less than for July, 1883, as shown by Exhibit 22.

Ozone (Day).—The average amount of atmospheric ozone by day for July was 0.22 of a degree less han the average for that month for the 8 years, 1877-84, and 0.39 of a degree less than the average for July, 1883, as shown by Exhibit 27.

Ozone (Night).—The average amount of atmospheric ozone by night for July was 0.17 of a degree greater than the average for that month for the 8 years, 1877-84, and 0.18 less than the average for July, 1883, as shown by Exhibit 28.

August, 1884.

Temperature.—The average temperature for August was 2.75° lower than the average for that month for the 8 years, 1877-84, and 0.69° higher than the average for August, 1883, as shown by Exhibit 5, page 26. The average of the daily range of temperature for August was 1.18° greater than the average for that month for the 6 years, 1879-84, and 1.38° less than the average for August, 1883, as shown by Exhibit 8.

Absolute Humidity (Grains of Vapor of Water in a Cubic Foot of Air).—The average for the month was 0.40 of a grain less than the average for the 8 years, 1877-84, and 0.32 of a grain greater than the average for August, 1883, as shown by Exhibit 11.

Relative Humidity (Per Cent. of Saturation of the Atmosphere).—The average for August was the same as the average for that month for the 7 years, 1878-84, and 2 per cent. greater than the average for August, 1883, as shown by Exhibit 13.

Cloudiness.—The average per cent. of cloudiness for August was 6 per cent. less than the average for that month for the 8 years, 1877-84, and 9 per cent. greater than the average for August, 1883, as shown by Exhibit 18.

Rainfall.—The rainfall for August was 1.18 inches less than the average for that month for the 8 years, 1877-84, and 0.99 of an inch greater than for August, 1883, as shown by Exhibit 22.

Ozone (Day).—The average amount of atmospheric ozone by day for August was 0.21 of a degree less than the average for that month for the 8 years, 1877-84, and 0.01 of a degree less than the average for August, 1883, as shown by Exhibit 27.

Ozone (Night).—The average amount of atmospheric ozone by night for August was 0.34 of a degree greater than the average for that month for the 8 years, 1877-84, and 0.22 of a degree greater than the average for August, 1883, as shown by Exhibit 28.

September, 1884.

Temperature.—The average temperature for September was 2.67° higher than the average for that month for the 8 years, 1877-84, and 7.48° higher than the average for September, 1883, as shown by Exhibit 5, page 26. The average of the daily range of temperature for September was 1.10° greater than the average for that month for the 6 years, 1879-84, and 0.81° less than the average for September, 1883, as shown by Exhibit 8.

Absolute Humidity (Grains of Vapor of Water in a Cubic Foot of Air).—The average for the month was 0.21 of a grain greater than the average for September for the 8 years, 1877-84, and 0.93 of a grain greater than the average for September, 1883, as shown by Exhibit 11.

Relative Humidity (Per Cent. of Saturation of the Atmosphere).—The average for September was 2 per cent. less than the average for that month for the 7 years, 1878-84, and 2 per cent. less than the average for September, 1883, as shown by Exhibit 13.

Cloudiness.—The average per cent. of cloudiness for September was 3 per cent. less than the average for that month for the 8 years, 1877-84, and 6 per cent. less than the average for September, 1883, as shown by Exhibit 18.

Rainfall.—The rainfall for September was 0.06 of an inch greater than the average for that month for the 8 years, 1877-84, and 1.12 inches greater than for September, 1883, as shown by Exhibit 22.

Ozone (Day).—The average amount of atmospheric ozone by day for September was 0.43 of a degree less than the average for that month for the 8 years, 1877-84, and 0.37 of a degree less than the average for September, 1883, as shown by Exhibit 27.

Ozone (Night).—The average amount of atmospheric ozone by night for September was 0.07 of a

Relative Humidity (Per Cent. of Saturation of the Atmosphere).—The average for May was 3 per cent. greater than the average for that month for the 7 years, 1878-84, and the same as the average for May, 1883, as shown by Exhibit 13.

Cloudiness.—The average per cent. of cloudiness for May was 4 per cent. greater than the average for that month for the 8 years, 1877-84, and 10 per cent. less than the average for May, 1883, as shown by Exhibit 18.

Rainfall.—The rainfall for May was 0.39 of an inch less than the average for that month for the 8 years, 1877-84, and 2.81 inches less than for May, 1883, as shown by Exhibit 22.

Ozone (Day).—The average amount of atmospheric ozone by day for May was 0.21 of a degree less than the average for that month for the 8 years, 1877-84, and 0.40 of a degree less than the average for May, 1883, as shown by Exhibit 27.

Ozone (Night).—The average amount of atmospheric ozone by night for May was 0.01 of a degree greater than the average for that month for the 8 years, 1877-84, and 0.53 of a degree less th anthe average for May, 1883, as shown in Exhibit 28.

June, 1884.

Temperature.—The average temperature for June was 1.50° higher than the average for that month for the 8 years, 1877-84, and 2.31° higher than the average for June, 1883, as shown by Exhibit 5, page 26. The average of the daily range of temperature for June was 1.86° greater than the average for that month for the 6 years, 1879-84, and 2.77° greater than the average for June, 1883, as shown by Exhibit 8.

Absolute Humidity (Grains of Vapor of Water in a Cubic Foot of Air).—The average for the month was 0.24 of a grain greater than the average for June for the 8 years, 1877-84, and 0.14 of a grain greater than the average for June, 1883, as shown by Exhibit 11.

Relative Humidity (Per Cent. of Saturation of the Atmosphere).—The average for June was 1 per cent. greater than the average for that month for the 7 years, 1878-84, and 4 per cent less than the average for June, 1883, as shown by Exhibit 13.

Cloudiness.—The average per cent. of cloudiness for June was 8 per cent. less than the average for that month for the 8 years, 1877-84, and 18 per cent. less than the average for June, 1883, as shown by Exhibit 18.

Rainfall.—The rainfall for June was 1.56 inches less than the average for that month for the 8 years, 1877-84, and 4.46 inches less than for June, 1883, as shown by Exhibit 22.

Ozone (Day).—The average amount of atmospheric ozone by day for June was 0.28 of a degree less than the average for that month for the 8 years, 1877-84, and 0.42 of a degree less than the average for June, 1883, as shown by Exhibit 27.

Ozone (Night).—The average amount of atmospheric ozone by night for June was 0.21 of a degree less that the average for that month for the 8 years, 1877-84, and 0.42 of a degree less than the average for June, 1883, as shown by Exhibit 28.

July, 1884.

Temperature.—The average temperature for July was 3.98° lower than the average for that month for the 8 years, 1877-84, and 1.66° lower than the average for July, 1883, as shown by Exhibit 5, page 26. The average of the daily range of temperature for July was 1° greater than the average for that month for the 6 years, 1879-84, and 1.77° greater than the average for July, 1883, as shown by Exhibit 8.

Absolute Humidity (Grains of Vapor of Water in a Cubic Foot of Air).—The average for the month was 0.73 of a grain less than the average for July for the 8 years, 1877-84, and 0.62 of a grain less than the average for that month for 1883, as shown by Exhibit 11.

Relative Humidity (Per Cent of Saturation of the Atmosphere).—The average for July was 1 per cent. less than the average for that month for the 7 years, 1878-84, and 5 per cent. less than the average for July, 1883, as shown by Exhibit 13.

Cloudiness.—The average per cent. of cloudiness for July was 5 per cent. greater than the average for that month for the 8 years, 1877-84, and 3 per cent. less than the average for July, 1883, as shown by Exhibit 18.

RAINFALL.—The rainfall for July was 0.81 of an inch less than the average for that month for the 8 years, 1877-84, and 3.11 inches less than for July, 1883, as shown by Exhibit 22.

OZONE (DAY).—The average amount of atmospheric ozone by day for July was 0.22 of a degree less than the average for that month for the 8 years, 1877-84, and 0.39 of a degree less than the average for July, 1883, as shown by Exhibit 27.

OZONE (NIGHT).—The average amount of atmospheric ozone by night for July was 0.17 of a degree greater than the average for that month for the 8 years, 1877-84, and 0.18 less than the average for July, 1883, as shown by Exhibit 28.

AUGUST, 1884.

TEMPERATURE.—The average temperature for August was 2.75° lower than the average for that month for the 8 years, 1877-84, and 0.69° higher than the average for August, 1883, as shown by Exhibit 5, page 26. The average of the daily range of temperature for August was 1.18° greater than the average for that month for the 6 years, 1879-84, and 1.38° less than the average for August, 1883, as shown by Exhibit 8.

ABSOLUTE HUMIDITY (GRAINS OF VAPOR OF WATER IN A CUBIC FOOT OF AIR).—The average for the month was 0.40 of a grain less than the average for the 8 years, 1877-84, and 0.32 of a grain greater than the average for August, 1883, as shown by Exhibit 11.

RELATIVE HUMIDITY (PER CENT. OF SATURATION OF THE ATMOSPHERE).—The average for August was the same as the average for that month for the 7 years, 1878-84, and 2 per cent. greater than the average for August, 1883, as shown by Exhibit 13.

CLOUDINESS.—The average per cent. of cloudiness for August was 6 per cent. less than the average for that month for the 8 years, 1877-84, and 9 per cent. greater than the average for August, 1883, as shown by Exhibit 18.

RAINFALL.—The rainfall for August was 1.18 inches less than the average for that month for the 8 years, 1877-84, and 0.99 of an inch greater than for August, 1883, as shown by Exhibit 22.

OZONE (DAY).—The average amount of atmospheric ozone by day for August was 0.21 of a degree less than the average for that month for the 8 years, 1877-84, and 0.01 of a degree less than the average for August, 1883, as shown by Exhibit 27.

OZONE (NIGHT).—The average amount of atmospheric ozone by night for August was 0.34 of a degree greater than the average for that month for the 8 years, 1877-84, and 0.22 of a degree greater than the average for August, 1883, as shown by Exhibit 28.

SEPTEMBER, 1884.

TEMPERATURE.—The average temperature for September was 2.67° higher than the average for that month for the 8 years, 1877-84, and 7.48° higher than the average for September, 1883, as shown by Exhibit 5, page 26. The average of the daily range of temperature for September was 1.10° greater than the average for that month for the 6 years, 1879-84, and 0.81° less than the average for September, 1883, as shown by Exhibit 8.

ABSOLUTE HUMIDITY (GRAINS OF VAPOR OF WATER IN A CUBIC FOOT OF AIR).—The average for the month was 0.21 of a grain greater than the average for September for the 8 years, 1877-84, and 0.93 of a grain greater than the average for September, 1883, as shown by Exhibit 11.

RELATIVE HUMIDITY (PER CENT. OF SATURATION OF THE ATMOSPHERE).—The average for September was 2 per cent. less than the average for that month for the 7 years, 1878-84, and 2 per cent. less than the average for September, 1883, as shown by Exhibit 13.

CLOUDINESS.—The average per cent. of cloudiness for September was 3 per cent. less than the average for that month for the 8 years, 1877-84, and 6 per cent. less than the average for September, 1883, as shown by Exhibit 18.

RAINFALL.—The rainfall for September was 0.06 of an inch greater than the average for that month for the 8 years, 1877-84, and 1.12 inches greater than for September, 1883, as shown by Exhibit 22.

OZONE (DAY).—The average amount of atmospheric ozone by day for September was 0.43 of a degree less than the average for that month for the 8 years, 1877-84, and 0.37 of a degree less than the average for September, 1883, as shown by Exhibit 27.

OZONE (NIGHT).—The average amount of atmospheric ozone by night for September was 0.07 of a degree greater than the average for that month for the 8 years, 1877-84, and 0.19 of a degree less than the average for September, 1883, as shown by Exhibit 28.

OCTOBER, 1884.

TEMPERATURE.—The average temperature for October was 0.22° higher than the average for that month for the 8 years, 1877-84, and 4.83° higher than the average for October, 1883, as shown by Exhibit 5, page 26. The average of the daily range of temperature for October was 1.13° degrees greater than the average for that month for the 6 years, 1879-84, and 2.99° greater than the average for October, 1883, as shown by Exhibit 8.

ABSOLUTE HUMIDITY (GRAINS OF VAPOR OF WATER IN A CUBIC FOOT OF AIR).—The average for the month was 0.07 less than the average for October for the 8 years, 1877-84, and 0.50 of a grain greater than the average for October, 1883, as shown by Exhibit 11.

RELATIVE HUMIDITY (PER CENT. OF SATURATION OF THE ATMOSPHERE).—The average for October was 13 per cent. greater than the average for that month for the 7 years, 1878-84, and 1 per cent. less than the average for October, 1883, as shown by Exhibit 13.

CLOUDINESS.—The average per cent. of cloudiness for October was 2 per cent. less than the average for that month for the 8 years, 1877-84, and 13 per cent. less than the average for October, 1883, as shown by Exhibit 18.

RAINFALL.—The rainfall and melted snow for October was 0.75 of an inch greater than the average for that month for the 8 years, 1877-84, and 1.27 inches greater than for October, 1883, as shown by Exhibit 22.

OZONE (DAY).—The average amount of atmospheric ozone by day for October was 0.38 of a degree less than the average for that month for the 8 years, 1877-84, and 0.54 of a degree less than the average for October, 1883, as shown by Exhibit 27.

OZONE (NIGHT).—The average amount of atmospheric ozone by night for October was 0.13 of a degree less than the average for that month for the 8 years, 1877-84, and 0.54 of a degree less than the average for October, 1883, as shown by Exhibit 28.

NOVEMBER, 1884.

TEMPERATURE.—The average temperature for November was 1.46° lower than the average for that month for the 8 years, 1877-84, and 3.57° lower than the average for November, 1883, as shown by Exhibit 5, page 26. The average of the daily range of temperature for November was 1.22° greater than the average for that month for the 6 years, 1879-84, and 0.03° greater than the average for November, 1883, as shown by Exhibit 8.

ABSOLUTE HUMIDITY (GRAINS OF VAPOR OF WATER IN A CUBIC FOOT OF AIR).—The average for the month was 0.20 of a grain less than the average for November for the 8 years, 1877-84, and 0.32 of a grain less than the average for November, 1883, as shown by Exhibit 11.

RELATIVE HUMIDITY (PER CENT. OF SATURATION OF THE ATMOSPHERE).—The average for November was 1 per cent. greater than the average for that month for the 7 years, 1878-84, and 3 per cent. greater than the average for November, 1883, as shown by Exhibit 13.

CLOUDINESS.—The average per cent. of cloudiness for November was 5 per cent. less. than the average for that month for the 8 years, 1877-84, and 1 per cent. greater than the average for November, 1883, as shown by Exhibit 18.

RAINFALL.—The rainfall and melted snow for November was 1.17 inches less than the average for that month for the 8 years, 1877-84, and 1.68 inches less than for November, 1883, as shown by Exhibit 22.

OZONE (DAY).—The average amount of atmospheric ozone by day for November was 0.59 of a degree less than the average for that month for the years 1877-84, and 0.57 of a degree less than the average for November, 1883, as shown by Exhibit 27.

OZONE (NIGHT).—The average amount of atmospheric ozone by night for November was 0.51 of a degree less than the average for that month for the years 1877-84, and 0.42 of a degree less than the average for November, 1883, as shown by Exhibit 28.

DECEMBER, 1884.

TEMPERATURE.—The average temperature for December was 2.48° lower than the average for that month for the 8 years, 1877-84, and 2.12° lower than the average for December, 1883, as shown by Exhibit 5, page 26. The average of the daily range of temperature for December was 0.78° greater than the average for that month for the 6 years, 1879-84, and 1.04° less than the average for December, 1883, as shown by Exhibit 8.

Absolute Humidity (Grains of Vapor of Water in a Cubic Foot of Air).—The average for the month was 0.09 of a grain less than the average for December for the 8 years, 1877-84, and 0.03 of a grain greater than the average for December, 1883, as shown by Exhibit 11.

Relative Humidity (Per Cent. of Saturation of the Atmosphere).—The average for December was 1 per cent. greater than the average for that month for the 7 years, 1878-84, and 3 per cent. greater than the average for December, 1883, as shown by Exhibit 13.

Cloudiness.—The average per cent. of cloudiness for December was 3 per cent. greater than the average for that month for the 8 years, 1877-84, and 11 per cent. greater than the average for December, 1883, as shown by Exhibit 18.

Rainfall.—The rainfall and melted snow for December was 2.14 inches greater than the average for that month for the 8 years, 1877-84, and 3.28 inches greater than for December, 1883, as shown by Exhibit 22.

Ozone (Day).—The average amount of atmospheric ozone by day for December was 0.54 of a degree less than the average for that month for the 8 years, 1877-84, and 0.63 of a degree less than the average for December, 1883, as shown by Exhibit 27.

Ozone (Night).—The average amount of atmospheric ozone by night for December was 0.48 of a degree less than the average for that month for the 8 years, 1877-84, and 0.67 of a degree less than the average for December, 1883, as shown by Exhibit 28.

METEOROLOGICAL CHARACTERISTICS OF THE YEAR 1884, AT ONE CENTRAL STATION.

At the State Agricultural College, near Lansing, and near the centre of the thickly settled part of the State, the average temperature for 1884 was 2.14° higher than for 1883, and 1.02° lower than the average for the preceding 20 years; the annual range of temperature was 4° greater than in 1883, and 3° greater than the average annual range for the preceding 11 years; the average monthly range of temperature was 1° greater than in 1883, and 2° greater than the average for the 11 preceding years; the average daily range of temperature was .12° less than in 1883, and .96° less than the average for the preceding 10 years; the average cloudiness was the same as in 1883, and equal to the average for the preceding 20 years; the rainfall (rain and melted snow) was 12.16 inches less than in 1883, and 4.13 inches more than the average for the preceding 20 years; the average atmospheric pressure was .007 inches less than in 1883, and .033 inches greater than the average for the preceding 9 years. In Exhibit 3, pages 14–15, is given by year and months, a comparison of conditions in 1884, at the Agricultural College, with those in 1883, and with averages for periods of years. September, October, and June (naming months in order of greatest difference), were months in which the average temperature in 1884 was higher than the average for corresponding months in the preceding 20 years; January, July, August, April, March, May, February, November, and December were months in which the average temperature in 1884 was lower than the average for corresponding months in the preceding 20 years, at that station, which is near the central part of the State.

EXHIBIT 3.—*Statements of Meteorological Conditions in the Year and in each Month of the Year, 1884, Compared with Annual and Monthly Averages for 1883, and for several Stated Periods of Years,—from observations by Prof. R. C. Kedzie, at the State Agricultural College, near Lansing, Michigan.*

Meteorological Conditions.	1884 Compared with Averages for Previous Years.		In 1884 More (+), or Less (-), than in 1883.	Meteorological Conditions.	1884 Compared with Averages for Previous Years.		In 1884 More (+), or Less (-), than in 1883.
	No. of Years Averaged, endi'g with 1883.	More (+), or Less (-), in 1884 than the Average for Previous Years.			No. of Years Averaged, endi'g with 1883.	More (+), or Less (-), in 1884 than the Average for Previous Years.	
YEAR 1884.				YEAR, 1884.			
Av. Temp	20	-1.02°	+ 2.14°	*Continued.*			
Range of Temp*	11	+ 3°	+ 4"	Cloudiness	20	0 per ct.	0 per ct.
Av. Monthly Range of Temp*	11	+ 2°	+ 1°	Rainfall	20	+ 4.13 in.	-12.16 in.
Av. Daily Range of Temp*	10	-.96°	-.12	Atmospheric Pressure	9	+ .033 in.	-.007 in.
JANUARY.				FEBRUARY.			
Av. Temp	20	-6.97°	+ 1.07°	Av. Temp	20	-1.15°	+ 3.67°
Range of Temp*	11	+ 9°	+ 6°	Range of Temp*	11	+ 12°	0
Av. Daily Range of Temp*	10	-.09°	-1.06°	Av. Daily Range of Temp*	10	-.10°	-2.83°
Cloudiness	20	+ 5 per ct.	+ 10 per ct.	Cloudiness	20	+ 21 per ct.	+ 24 per ct.
Rainfall	20	-.49 in.	-.30 in.	Rainfall	20	+ 1.74 in.	-.81 in.
Atmospheric Pressure	9	+ .043 in.	+ .002 in.	Atmospheric Pressure	9	+ .016 in.	-.158 in.
MARCH.				APRIL.			
Av. Temp	20	-1.72°	+ 5.00°	Av. Temp	20	-2.05°	+ .18°
Range of Temp*	11	+ 10°	+ 10°	Range of Temp*	11	-10°	-16°
Av. Daily Range of Temp*	10	+ .03	-2.46°	Av. Daily Range of Temp*	10	-1.77°	-0.50°
Cloudiness	20	-2 per ct.	+ 13 per ct.	Cloudiness	20	+ 1 per ct.	+ 3 per ct.
Rainfall	20	+ 1.03 in.	+ 2.96 in.	Rainfall	20	-.58 in.	+ 1.05 in.
Atmospheric Pressure	9	+ .076 in.	+ .025 in.	Atmospheric Pressure	9	+ .008 in.	-.018 in.
MAY.				JUNE.			
Av. Temp	20	-1.37°	+ 3.92°	Av. Temp	20	+ 1.09°	+ 3.05°
Range of Temp*	11	-6°	+ 3°	Range of Temp*	11	-6°	+ 1°
Av. Daily Range of Temp*	10	-2.99°	+ 0.26°	Av. Daily Range of Temp*	10	+ 1.15°	+ 4.77°
Cloudiness	20	-1 per ct.	-16 per ct.	Cloudiness	20	-10 per ct.	-21 per ct.
Rainfall	20	+ .82 in.	-1.71 in.	Rainfall	20	-1.54 in.	-8.52 in.
Atmospheric Pressure	9	-.052 in.	+ .001 in.	Atmospheric Pressure	9	+ .256 in.	+ .271 in.

*By registering thermometers, set at 7 A.M., and recorded at 7 A.M., for the preceding calendar day.

EXHIBIT 3.—CONTINUED.—*Meteorological Conditions at the Agricultural College, in Months for the Year 1884, Compared with Averages for Corresponding Months in Preceding Years.*

Meteorological Conditions.	1884 Compared with Averages for Previous Years.		In 1884	Meteorological Conditions.	1884 Compared with Averages for Previous Years.		In 1884
	No. of Years Averaged, endi'g with 1883.	More (+), or Less (-), in 1884 than the Average for Previous Years.	More (+), or Less (-), than in 1883.		No. of Years Averaged, endi'g with 1883.	More (+), or Less (-), in 1884 than the Average for Previous Years.	More (+), or Less (-), than in 1883.
JULY.				AUGUST.			
Av. Temp............	20	-3.68°	-.90°	Av. Temp............	20	-2.22°	+ 2.01°
Range of Temp*......	11	-3°	0	Range of Temp*....	11	0	-5°
Av. Daily Range of Temp*............	10	-.24°	+ 5.35°	Av. Daily Range of Temp*............	10	-1.96°	-1.51°
Cloudiness............	20	0 per ct.	-8 per ct.	Cloudiness...........	20	-11 per ct.	+ 2 per ct.
Rainfall...............	20	-1.09 in.	-8.67 in.	Rainfall..............	20	-1.44 in.	+ 1.12 in.
Atmospheric Pressure................	9	-.050 in.	-.055 in.	Atmospheric Pressure................	9	+ .055 in.	-.021 in.
SEPTEMBER.				OCTOBER.			
Av. Temp............	20	+ 4.90°	+ 8.63°	Av. Temp............	20	+ 2.58°	+ 4.74°
Range of Temp*......	11	-4°	-5°	Range of Temp*....	11	+ 1°	+ 4°
Av. Daily Range of Temp*............	10	-1.90°	-2.97°	Av. Daily Range of Temp*............	10	-.50°	+ 2.05°
Cloudiness............	20	-14 per ct.	-17 per ct.	Cloudiness...........	20	-6 per ct.	-17 per ct.
Rainfall...............	20	+ .48 in.	+ 1 in.	Rainfall..............	20	+ 3.21 in.	+ 2.07 in.
Atmospheric Pressure................	9	+ .016 in.	-.031 in.	Atmospheric Pressure................	9	-.053 in.	-.117 in.
NOVEMBER.				DECEMBER.			
Av. Temp............	20	-1.11°	-3.97°	Av. Temp............	20	-.79°	-1.68°
Range of Temp*......	11	-6°	-7°	Range of Temp*....	11	+ 23°	+ 21°
Av. Daily Range of Temp*............	10	+ .43°	-1.23°	Av. Daily Range of Temp*............	10	-.63°	-1.32°
Cloudiness............	20	-6 per ct.	+ 3 per ct.	Cloudiness...........	20	+ 11 per ct.	+ 22 per ct.
Rainfall...............	20	-.41 in.	-2.14 in.	Rainfall..............	20	+ 2.35 in.	+ 2.79 in.
Atmospheric Pressure................	9	+ .029 in.	-.004 in.	Atmospheric Pressure................	9	+ .051 in.	+ .016 in.

*By registering thermometers, set at 7 A.M., and recorded at 7 A.M., for the preceding calendar day.

Comments on Exhibit 3 are printed on page 13.

The uniform low temperature for the months January to May inclusive, July, August, and November, and the light rainfall for June, July, and August are especially noticeable.

LOCAL METEOROLOGICAL PHENOMENA IN THE SEVERAL MONTHS OF THE YEAR 1884.

The following general remarks relative to temperature, frosts, effects on vegetation, migration of birds, etc., in 1884, are taken from the monthly reports by observers. The names of observers are stated in Exhibit 1, page 6.

JANUARY.

Lake Superior frozen over.—*Marquette.*

Ice in Lake Michigan, 2 miles from shore, Jan. 6. Broke up Jan. 12.—*Manistique.*

Frosts, Jan. 1 to 27 and 29 to 31. Temperature of Green Bay, frozen.—*Escanaba.*

Grand Traverse Bay froze over on the night of Jan. 15.—*Traverse City.*

Heavy white frost Jan. 15, 16. Straits frozen over during the month. Ice ranging from 1 to 15 feet thick. Steamer Algomah abandoned in Middle Straits, Mackinaw, Jan. 28.—*Mackinaw City.*

Frosts, Jan. 4, 6, 10, 15, 16, 20, 25, 26. Melting snow on ground Jan. 13, 14, 17, 18, 22, 28, 29, 30, 31. Ground frozen 18 inches deep.—*Alpena.*

Heavy thaw Jan. 13, 28, 29.- *Grand Haven.*

Lowest mercury for many years about 9 A. M. Jan. 24. Then the sky became overcast and the mercury rose from —19° to —16°. With a clear sky the mercury would probably have touched —24°. January has been a winter month of unusual severity, beating its own record of last year about one degree. The snow fall has been considerable, and has drifted badly. The usual January thaw did not come till the 30th, melting a part of the snow, and leaving much ice on the ground, which is likely to be bad for the wheat. Ice in the ponds is about 14 inches thick.—*Thornville.*

Frozen ground Jan. 1, 31. Melting snow Jan. 13, 22, 28, 29, 30. Jan. 10, ice now being cut for ice-houses is 12 to 18 inches thick.—*Ionia.*

Frosts, Jan. 16, 25.—*Swartz Creek.*

"Have kept watch for icicles this winter, and have not seen any of note; have never known of such a scarcity before."—Lee S. Cobb, *Winfield.*

On the night of January 24 the thermometer registered 30° below zero. Coldest ever known here. —*Hudson.*

FEBRUARY.

Lake Superior frozen over.—*Marquette.*

Feb. 2, Manistique Harbor open. Ice on lake 3 inches thick Feb. 5. Lake entirely open Feb. 25; closed by ice Feb. 28.—*Manistique.*

Frosts, Feb. 1 to 21, and 23 to 29. Thaws, Feb. 17, 18, 19, 24, 25, 26. Temperature of Green Bay, frozen.—*Escanaba.*

Frosts, Feb. 11, 24.—*Mackinaw City.*

Frosts, Feb. 1, 4, 7, 10, 11, 15, 24, 29. Melting snow on ground, Feb. 5, 8, 9, 13, 17, 18, 19, 22, 26. Ground frozen 12 to 18 inches deep.—*Alpena.*

Feb. 1, ground frozen about 15 inches deep. Heavy thaws Feb. 5, 8, 16, 17, 18.—*Grand Haven.*

Feb. 5, trees covered with ice in the morning. Ice dropped at 9 A. M. A stormy, windy month, with some very cold weather, but with a mean temperature, not lower than the long average. Snow on the ground at the close 6 or 8 inches. Ice on the ponds about 18 inches thick. Frost in the ground varying from very little in the woods to 30 inches or more in the open.—*Thornville.*

Melting snow on ground Feb. 8, 9, 12, 15, 16, 17, 18, 19, 26, 27. Feb. 4 and 5, thick ice formed over the old snow, and trees and branches were encrusted in ice.—*Ionia.*

Feb. 4, sleet storm, covering everything with a thick layer of ice.—*Lansing.*

Feb. 4, rain froze as fast as it fell, and ice to the depth of one-half inch was formed. Frost, Feb. 10. Snow on ground at end of month, estimated 4 inches.—*Swartz Creek.*

Feb. 4, frost all day covering the trees. Feb. 5, very slippery. Feb. 12, everything covered with ice, trees being broken down with its weight. Feb. 29, about 3 inches of snow on the ground, on a good ice foundation, making fair sleighing.—*Hillsdale.*

Feb. 4, ice storm afternoon and night; also on Feb. 6, 11 and 12. Bluebirds, hawks and crows observed Feb. 19. Robin observed Feb. 22.—*Hudson.*

MARCH.

Lake Superior frozen over.—*Marquette.*

March 10, ice storm. March 16, first crows seen. March 17, ice 4 miles from shore. March 23, first robin seen. Lake Michigan open March 23. Manistique Harbor open March 26. Melting snow on ground March 20 to 31. Manistique River discharged 1,306 cubic feet of water per second March 15. —*Manistique.*

Frosts, March 1 to 22, and 24 to 31. Thaws, March 11, 14, 17 to 22, 24, 25. Temperature of Green Bay, frozen.—*Escanaba.*

Robins arrive March 24.—*Traverse City.*

Frosts, March 1, 2, 4, 6, 10, 13, 14, 15, 16, 18, 21, 22, 24, 25, 27, 28, 30, 31. Melting snow on ground March 9 to 15. Ground frozen 8 inches.—*Alpena.*

Frosts, March 13, 14, 15, 16, 18, 24, 27, 30. Grand River closed March 3; opened during night of March 10 to 11.—*Grand Haven.*

Frosts, March 10, 14, 15, 16, 19, 24, 27.—*Grand Rapids.*

Frosts, March 15, 18. March 18, snow nearly gone. March 28, spring opening up fine.—*Port Austin.*

First robin seen March 16. Bluebird, March 17. Song sparrow, kill-deer plover, and large flocks of mixed blackbirds March 23. Blackhead fly-catcher, March 24. March 23, frogs first heard, and grass began to grow. The first part of March was cold winter; the latter part, quite mild for the season. Mean temperature not much below the normal. The frost went out of the ground with the rain of the 25th and 26th. The month has not been unfavorable for the wheat on the ground, which, though small, is not much winter killed, and looks very well. Peach buds are nearly all dead.—*Thornville.*

Frosts, March 27, 30. March 11, bluebirds and meadow larks seen. March 17, first robin seen. March 21, blackbirds first heard. March 29, a woodcock shot north of the city this morning. March 11 and 31, melting snow on the ground.—*Ionia.*

Frosts, March 4, 10, 14, 15, 18, 24, 27. First robin heard this season March 15. Ice began to move in Grand River March 19. River opened March 21. Ground free from frost in many places March 24. —*Lansing.*

Frosts, March 1, 4, 9, 14, 15, 17, 23, 24, 26, 29. March 17, robins and meadow larks first seen. March 18, blackbirds first seen. March 24, bluebirds and kill-deers first seen. March 28, frost out of the ground. Wheat is looking well.—*Swartz Creek.*

March 1, about 3 inches of snow on ground, ice foundation; pretty good sleighing. Frost, March 10. March 22, frost generally out of plowed ground, and 6 to 7 inches on turf ground. Greatest depth usually frozen during coldest weather, 2 feet. March 27, first butterfly seen this morning.—*Hillsdale.*

Spring birds arrived March 17, and wild geese March 27.—*Parkville.*

APRIL.

Lake Superior frozen over.—*Marquette.*

Frosts, April 5, 6, 7, 11, 13, 18, 21, 24, 29. April 1 to 16, melting snow on ground. April 18, frost out of ground. April 18, frogs appear. April 24, first wild flowers seen, "Arbutus." Greatest discharge of Manistique River during month, 6,956 cubic feet per second, April 21.—*Manistique.*

Frosts, April 1 to 11, and 13, 17, 18, 21, 22, 23, 29. April 1, navigation opened. Thaws, April 13, 14. Temperature of Green Bay at surface, 37.8°; at bottom, 36.6°; depth, 15 feet.—*Escanaba.*

Ice went out of Grand Traverse Bay April 26.—*Traverse City.*

April 1, melting snow on ground. April 11, navigation open. Frosts, April 4, 6, 7, 11, 12, 13, 19, 22, 29.—*Alpena.*

Frosts occurred April 3, 5, 6, 9, 18, 21, 22, 25, 26.—*Grand Haven.*

April 10, navigation open. April 15, first steamer passed. April 29, first steamer came into Port Austin.—*Port Austin.*

April 24, poplar and hazelnut in blossom. April 28, apple tree buds opening. April 3, first snake seen. April 24, barn swallows returned. April 25, first bumble bee seen. April has been a cool, dry month, mean temperature about 9° below the normal. The cold dryness has materially injured the growing wheat. Peach buds are all killed by the severity of the winter. The month is remarkable for the lowest barometrical pressure observed for many years (28.200 on April 15), and for some of the dryest days ever noted.—*Thornville.*

Frosts, April 3, 4, 5, 6, 7, 11, 18, 23, 24, 25, 26, 29. Ice formed April 3 to 18, 21, 22, 23, 24. Frozen ground on April 3 to 8, and 11, 18, 21, 22.—*Ionia.*

Frosts, April 3, 4, 6, 10, 11, 12, 17, 18, 23, 24, 25, 28. Plowing began April 17. April 18, wild geese flying north. April 21, oats sown.—*Swartz Creek.*

Frost, April 17.—*Kalamazoo.*

Frosts, April 2 to 8, 11, 18, 21, 25. Ground frozen April 2, 3, 4, 5, 8, 17, 18, 21. Frost all out of ground April 12.—*Lansing.*

MAY.

Frosts, May 16, 17, 28, 29. May 31, maple trees in full leaf. Manistique River flows 2,205 cubic feet per second May 16, and 1,547 cubic feet per second May 30. Temperature of Manistique River, 50° May 17; of Lake Michigan, 57° May 17.—*Manistique.*

Frosts, May 3, 11, 14, 15, 16, 17, 18, 20, 29. Snow May 2.—*Escanaba.*

Frosts, May 14, 15, 28.—*Traverse City.*

Frost, May 28.—*Mackinaw City.*

Frosts, May 15, 16, 17.—*Alpena.*

Frosts, May 11, 14, 29.—*Grand Haven.*

Frosts, May 17, 27.—*Port Austin.*

Return of migratory birds: May 1, brown thrush and cat-bird; May 6, whip-poor-will; May 9, bobolink; May 15, night hawk; May 18, king bird; May 20, cuckoo. Growth of vegetation: May 5, wild cherry and soft maple leafing; May 7, juneberry in blossom; May 8, mandrakes up; May 10, dandelions in blossom; May 12, sweet cherries in blossom; May 18, apple trees in blossom; May 21, white oak buds open. May has been a month of fair average conditions, except two or three very cold days and nights. There were frosts on the mornings of May 28 and 29, which did considerable harm, killing whatever corn, potatoes and garden stuff was up, injuring fruit some, especially grapes, which are about all killed. Wheat and clover are hurt in places, but the injury is not probably serious. It is not believed that the apples are much hurt.—*Thornville.*

Frost, May 15; killing frost May 28.—*Agricultural College.*

Frosts, 3, 14, 16, 27, 28, 29. Considerable damage was done to garden vegetables by frost May 29. In blossom: May 2, dandelions, white oak and ash; May 8, common cherry; May 10, apples; May 20, lilac; May 21, horsechestnut. In leaf: May 3, horsechestnut, white birch; May 5, mountain ash; May 6, sugar maple; May 8, apple; May 10, elm; May 17, butternut; May 19, white oak. Insects: May 3, pismires throwing up hills, and small yellow butterfly seen; May 6, small white butterfly seen.—*Ionia.*

Frosts, May 2, 13, 15, 28. The frost of May 28 was very severe, doing much damage to gardens and fruit. Ice formed one-third of an inch thick. Oats and clover injured some. In blossom: Cherries, May 9; plums, May 10; apples, May 15. Corn planted May 16. Fultz wheat in head May 30. Other varieties about 5 days later.—*Swartz Creek.*

May 28, light frost. May 29, hard frost this morning, cutting fruits and vegetables.—*Hillsdale.*

May 29, light frost.—*Kalamazoo.*

May 29, ice formed.—*Parkville.*

Frosts, May 16, 29.—*Marshall.*

Frost, May 13. Ground frozen May 15, 28. May 29, very hard frost.—*Winfield.*

May 28, very severe frost, doing much damage to grapes, potatoes, corn, beans, etc.—*Hudson.*

Frosts, nights of May 2, 13, 28. Ice formed night of May 28, doing much damage to fruits and vegetables.—*Lansing.*

JUNE.

Manistique River flows 1,170 cubic feet per second June 20. Strawberries ripe June 21.—*Manistique.*

Frost, June 10.—*Traverse City.*

June 18, fire-flies first seen. June 27, haying began. June, with a considerable rainfall, has been still a very dry month. On account of the coolness of the nights and the dryness of the fore part of the month the growth of vegetation was little; after the rains, beginning on the 18th, it was very rapid.—*Thornville.*

June 16, haying began.—*Swartz Creek.*

JULY.

Temperature of Little Bay de Noquette, at surface, 61°; at bottom, 58.8°.—*Escanaba.*

Very dry till July 23, then a good deal of rain. The month is notable for the extreme coolness of the nights. As the month closes the wheat harvest is nearly finished. The wet weather of the last week did not materially injure the crop.—*Thornville.*

Wheat harvest began July 10.—*Swartz Creek.*

AUGUST.

Light frost on swampy ground Aug. 9. Light frost Aug. 24. Manistique River flowed 1,009 cubic feet per second Aug. 12, lowest stage of water. Temperature of Manistique River, 71° Aug. 17.—*Manistique.*

Frosts, Aug. 7, 8. Temperature of Little Bay de Noquette, at surface, 65°; at bottom, 63.9°; depth, 18 feet, 3 inches.—*Escanaba.*

Frosts, nights of Aug. 7, 8.—*Traverse City.*

Frosts, Aug. 9, 29. No damage done.—*Alpena.*

Frost, Aug. 9.—*Port Austin.*

Light frosts Aug. 8, 9, 10, 24. Katydid first heard Aug. 11. August was a dry and nearly cloudless month, noticeable for the coolness of the nights. The slight frosts of Aug. 9 and 10 killed some buckwheat in low grounds.—*Thornville.*

Frost on low ground Aug. 7 (first of the season) and 8.—*Hillsdale.*

Frost, Aug. 9.—*Ionia.*

Frosts, Aug. 8, 9.—*Hudson.*

Frosts, Aug. 7, 8.—*Swartz Creek.*

Frosts, Aug. 8, 9. Beans, buckwheat, corn and potatoes were killed on swamp land near by. Frost very light Aug. 24.—*Winfield.*

Frosts, Aug. 7, 8.—*Lansing.*

Light frost Aug. 8, 9.—*Agricultural College.*

SEPTEMBER.

First frost Sept. 22.—*Marquette.*

Temperature of Little Bay de Noquette, at surface, 63.3°; at bottom, 62.5°; depth, 18 feet, 3 inches. —*Escanaba.*

Frosts, Sept. 14, 19, 21, 23.—*Alpena.*

Frost, Sept. 21.—*Grand Haven.*

Frost, Sept. 19. September was a very dry month till the 23d, after which rains were abundant. Movements of migratory birds: Barn swallows were all gone by Sept. 1, blackbirds left about Sept. 20, robins and bluebirds are still to be seen as the month closes, and large mixed flocks of tree and field sparrows and golden-winged woodpecker are frequent. The month had no killing frosts, that of the 19th being very slight.—*Thornville.*

Frosts, Sept. 1, 21.—*Ionia.*

Frosts, Sept. 21, 25.—*Lansing.*

Frosts, Sept. 12, 18, 20.—*Swartz Creek.*

Light frost on low ground Sept. 21.—*Hillsdale.*

Frost, Sept. 21.—Hudson.

Earthquake.

Sept. 19, about 2:00 P.M., slight,—lasted about two seconds. Vibration from southeast to northwest. No damage known to have been done by shock.—*Alpena.*

Sept. 19, about 2:30 P.M.—*Swartz Creek.*

Sept. 19, between 2:39 and 2:41 P.M. (local time), lasting about half a minute, sufficient to rattle windows and give hanging objects a pendulous motion in a north and south direction.—*Ann Arbor.*

Sept. 19, about 3 P.M., a trembling motion was felt, accompanied with a noise like a heavily loaded wagon on the pavement, lasting about ten seconds.—*Marshall.*

Sept. 19, Light shock about 3:00 P.M., a number of window lights broken in second stories of buildings.—*Lansing.*

Sept. 19, light shock, 2:30 P.M.—*Hudson.*

Sept. 19, about 3:00 P.M., sufficient to rattle windows, doors, etc. Buildings vibrated perceptibly.—*Winfield.*

OCTOBER.

Manistique River flowed 2,718 cubic feet per second Oct. 3, and 3,894 cubic feet per second Oct. 10. Large flocks of gulls flying southward Oct. 14.—*Manistique.*

Frosts, Oct. 9, 14, 17, 18, 22, 23, 24, 25, 28, 30, 31. Ice formed Oct. 22, 23, 25, 28.—*Escanaba.*

Frosts, Oct. 9, 14, 15, 26. Melting snow on ground Oct. 24, 25, 26, 27.—*Alpena.*

Frosts, Oct. 9, 14, 15, 29.—*Grand Haven.*

Frosts, Oct. 9, 10, 14, 15, 17, 23. After Oct. 23 ice formed every day except Oct. 27. First snow Oct. 24. October, with a heavy rainfall, has been a fine growing month, with much sunshiny weather. Robins and bluebirds were seen till the 20th, and wild geese began to go south about the same time. The growing crops, wheat and clover, have much more top than at this time last year.—*Thornville.*

Frosts, Oct. 9, 10, 15, 17, 18, 25, 26, 29. Ice formed Oct. 9, 23, 24, 25, 29. Ground frozen Oct, 9, 23, 24, 25, 29.—*Ionia.*

Frosts, Oct. 8, 9, 13, 14, 16, 17, 18, 22, 25, 27, 28, 29. Ice formed Oct. 8, 9, 13, 14, 16, 17, 22, 23, 24,25, 28. Wild geese flying south Oct. 4, 6, 19, 20, 27. First snow Oct. 22.—*Swartz Creek.*

Killing frost Oct. 8. First snow Oct. 22.—*Agricultural College.*

Frosts, Oct. 9, 10.—*Kalamazoo.*

Frosts, Oct. 10, 14, 15, 17. Ground frozen Oct. 9, 23. First snow Oct. 22.—*Winfield.*

Frosts, Oct. 9, 10, 14. Ice formed Oct. 9. First snow Oct. 23. Ducks flying north Oct. 8.—*Hudson.*

Frosts, Oct. 8, 9, 13, 14, 17, 25, 28. Ice formed first time this season Oct. 22.—*Lansing.*

Frost (first of season, Oct. 9), 10, 14, 15. Snow, first of season, Oct. 23.—*Ann Arbor.*

NOVEMBER.

Melting snow on ground Nov. 2, 4, 6, 24 to 30.—*Manistique.*

Frosts, Nov. 1 to 9, 11 to 30. Ice formed Nov. 1 to 3, 5 to 8, 17 to 21, 23 to 30 inclusive. Temperature of Little Bay de Noquette, at surface, 42.5°; at bottom, 41.6°; depth, 17 feet, 4 inches.—*Escanaba.*

Frosts, Nov. 3, 9, 10, 11, 14, 16, 18, 19, 25, 28, 29.—*Alpena.*

Frosts, Nov. 3, 5, 8, 14, 15, 18, 19, 22. Melting snow on ground Nov. 27, 30.—*Grand Haven.*

Frosts or ice every morning except Nov. 1, 10, 11, 23. A very dry month, with considerable cloudy weather. Temperature and barometrical pressure equal to the long average. Ice about 2 inches thick on still water at close of the month, and the snow that fell on the 25th still on the ground in the hollows.—*Thornville.*

Frosts, Nov. 3, 5, 7, 8, 9, 13 to 16, 18, 19, 21, 30. Ice formed Nov. 3, 5 to 9, 14, 15, 16, 18 to 21, 24 to 30. Frozen ground Nov. 3, 5 to 9, 14, 15, 16, 18 to 21, 24 to 30. Melting snow Nov. 27.—*Ionia.*

Frosts, Nov. 1, 2, 6, 7, 8, 12 to 22, 30. Ice formed Nov. 1 to 8, 13 to 20, 27.—Wheat looking well.—*Swartz Creek.*

Frosts occurred Nov. 3, 7, 8, 9, 13 to 16, 19 to 22.—*Ann Arbor.*

Snow flurries Nov. 1. Frosts Nov. 2, 14, 15, 16. Ice formed Nov. 5, 17, 21. Ripe strawberries and blossoms found in field Nov. 14. Ground frozen ½ inch Nov. 5. Ground frozen 2 inches thick Nov. 21, which is said to be deeper than it has been known to be before by anyone living in this vicinity. No snow on ground in morning.—*Boyne City.*

Frosts, Nov. 2, 4, 5, 7, 13. Grand River closed Nov. 24.—*Lansing.*

DECEMBER.

Melting snow on ground Dec. 6 to 19. Last regular steamer Dec. 5. Manistique Harbor frozen over Dec. 18 and 25; only days this month. Fishing tugs ran till Dec. 29. Severe ice storm breaking trees, telegraph wires, etc., Dec. 31. Taking the rainfall at Manistique Village, as rainfall for the Manistique Valley, it appears by measurement that 57 per cent. of rainfall flows through the river to Lake Michigan. There are no cleared lands in the Manistique Valley that would affect evaporation at all, but considerable water surface.—*Manistique.*

Frosts, Dec. 1 to 5, 9 to 27, 30, 31. Ice formed Dec. 1, 2, 3, 9 to 27, 31. Thaws, Dec. 28, 29. Temperature mean of 15 days, of Little Bay de Noquette, at surface 36.1°; at bottom, 35.2°; depth, 16 feet 11 inches.—*Escanaba.*

Frosts, Dec. 1, 4, 5, 10, 11, 12, 16, 17, 18, 19, 20, 23, 26. Melting snow on ground Dec. 7, 9, 10, 11, 28, 29, 30, 31. Ground frozen 4 inches. Navigation closed Dec. 17.—*Alpena.*

A cloudy month with a good deal of precipitation. Temperature not below the long mean, but with a few very cold days. Sleighing began the 14th, and melted the 29th. No ice at the close of the month in the woods; only a few inches in the open and on the ponds. Last four days of the month very warm for the season.—*Thornville.*

Frost, Dec. 4. Melting snow Dec. 3 to 7, 27 to 30. Frost out of ground Dec. 6.—*Ionia.*

Frosts, Dec. 3, 9, 17, 18, 19, 24, 25. Melting snow, Dec. 28 to 31.—*Swartz Creek.*

Frosts, Dec. 1 to 4, 10. Snow was about 15 inches deep on undisturbed levels, Dec. 26, but by Dec. 30 had so nearly disappeared that sleighing was impossible. Snow all gone except in a few spots, Dec. 31. —*Ann Arbor.*

Melting snow on ground, Dec. 27 to 30.—*Battle Creek.*

Dec. 18, coldest night with one exception, in 15 years, thermometer registering 28° below zero.—*Hudson.*

Grand River open Dec. 8; closed (second time this season) night of Dec. 15. River opened Dec. 31. —*Lansing.*

Melting snow on ground Dec. 1, 3, 4, 5, 28 to 31. Ground has not been frozen during Dec. No snow on ground at close of month.—*Moorestown.*

Lake frozen over to one mile from shore, Dec. 18. Lake completely frozen over Dec. 19. Ice in lake broken up, Dec. 29.—*Boyne City.*

A NEW INSTRUMENT SHELTER AT LANSING.

During the years 1879-84 inclusive, observations with the psychrometer, open air thermometer, registering thermometers, and test paper for ozone, compilations of which are published in the annual reports of the State Board of Health, were made at the window of the office of the Secretary, at southwest side of the State Capitol building. The shelter for protection containing the instruments was placed just outside the window and 17 feet from the ground. The window had to be raised at each observation. Doubtless the close proximity of the building had an influence upon the instruments in several ways,—by reflection in summer, by warm-air currents in winter, and by the difference of the temperature of the air in the room rushing out when the window was raised.

In order that more accurate results might be obtained, a new shelter for instruments was made in accordance with improved plans and placed in the southwest corner of the Capitol yard, where it is comparatively free from the influence of the building; and from July 1, 1884, separate observations were taken in the old and in the new shelter till the close of the year. The instruments in this new shelter are 4 feet from the ground.

Comparisons of the results obtained, of the average monthly temperature, absolute and relative humidity, extremes of temperature, and average of the extremes of temperature for the six months will be found on pages 24 and 25.

In the report for 1886, containing the meteorology for 1885, the results for a full year may be shown.

The figures for Lansing for the year 1884, stating the average temperature (Table I.), extremes of temperature (Table II.), average daily range of temperature (Table III.), absolute humidity (Table IV.), and relative humidity (Table V.), and the accompanying exhibits for Lansing and the State, give the results of observations made at the window of the office of the State Board of Health.

The statements of day and night ozone at Lansing used in Tables VIII. and IX. and in the accompanying exhibits for Lansing and the State, are results of observations made at the office window from January to June inclusive, 1884; for the months July to December, 1884, inclusive; the computations were made from observations in the shelter for meteorological instruments. More complete statements relative to this subject are given further on, under the head—Ozone.

MEASUREMENTS AND TEMPERATURE OF GROUND WATER.

In a paper entitled "Typhoid Fever and Low Water in Wells," on pages 89–114 of the report of this board for 1884, it is shown that for the years 1878–82 there was a relation between the sickness and deaths from typhoid fever in Michigan and the depth of water in wells. In the month of October, when the water in wells reached the lowest point in the year, there were the most deaths and sickness from typhoid fever; and in the month of April, when the water in wells was highest, there were the least deaths and sickness from typhoid fever. When this comparison is made in a diagram, it is found that, "beginning with June in each year, the sickness from typhoid fever follows more or less closely the curve representing the average depth of earth above the ground-water."

The measurements, for each month in 1884, of the depth of wells, at eleven places in Michigan, are shown in Exhibit 4; also depth of earth above water in wells and temperature of water in wells. It is hoped these

EXHIBIT No. 4.—*Depth of Wells; Depth of Ground above Water in Well; Temperature 1884, as reported by Meteorological Observers for the State*

Stations in Michigan.	January.			February.			March.			April.			May.			June.		
	Depth of Well.—Ft., In.	Depth of Ground above Water in Well.—Ft., In.	Temp. of Water in Well.—Deg. F.	Depth of Well.—Ft., In.	Depth of Ground above Water in Well.—Ft., In.	Temp. of Water in Well.—Deg. F.	Depth of Well.—Ft., In.	Depth of Ground above Water in Well.—Ft., In.	Temp. of Water in Well.—Deg. F.	Depth of Well.—Ft., In.	Depth of Ground above Water in Well.—Ft., In.	Temp. of Water in Well.—Deg. F.	Depth of Well.—Ft., In.	Depth of Ground above Water in Well.—Ft., In.	Temp. of Water in Well.—Deg. F.	Depth of Well.—Ft., In.	Depth of Ground above Water in Well.—Ft., In.	Temp. of Water in Well.—Deg. F.
Manistique	14 2	10.	40^{13}	----	----	----	----	----	----	----	----	----	14 2	10	42^{17}	14 2	10	45^{17}
Boyne City	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----
Lexington	14	3 6	36^{16}	14	3	36^{15}	14	3	37^{16}	14	3	38^{17}	14	3	41^{17}	13 6	5 6	40^{16}
Thornville	20	16 1	37^{16}	20	16 11	38^{16}	20	16 4	42^{15}	20	16 3	42^{15}	20	16 2	44^{17}	20	16 6	48^{17}
Lansing	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----
	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----
	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----
Ann Arbor	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----
	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----
	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----
Battle Creek	80	72	48^{20}	80	76	46^{20}	80	76	50^{21}	80	74 2	54^{18}	80	73 5	----	----	----	----
Hillsdale	27	22 11	48^{15}	27	20 2	48^{12}	27	18 1	45^{15}	27	18	47^{15}	27	19 1	46^{15}	27	20 1	46^{15}
Kalamazoo (Asylum)	24	3 6	50^{15}	24	2	49^{25}	24	7	50^{22}	24	6 3	49.5^{17}	24	3 7	49.5^{15}	24	2	50^{16}
Mendon	----	----	----	----	----	----	16 6	14 5	46^{16}	----	----	----	18	16 1	38^{15}	----	----	----
Tecumseh	40	36	50	40	36	50	40	36	50	40	36 6	50^{17}	40	37	51^{20}	40	36	50^{20}

NOTE.—The small figures above and at the right of the numbers denoting the degrees of temperature, state the day of the month on which the observation was made. On pages 16-20 are recorded the date of observation of temperature of water of Manistique river and the number of cubic feet it was flowing per second, by Arthur Beebe, at Manistique; also, temperature of Little Bay de Noquette, Green Bay, and Lake Superior by the observers at those localities.

measurements and observations may continue, and permit a more extended comparison of the depth of water in wells with the sickness from typhoid fever, and with sickness and death from other diseases.

of Water in Well, and Day of observation of such temperature, in each month of the year Board of Health, and for the United States Signal Service.

July.			August.			September.			October.			November.			Decem er.		
Depth of Well.—Ft., In.	Depth of Ground above Water in Well.—Ft., In.	Temp. of Water in Well.—Deg. F.	Depth of Well.—Ft., In.	Depth of Ground above Water in Well.—Ft., In.	Temp. of Water in Well.—Deg. F.	Depth of Well.—Ft., In.	Depth of Ground above Water in Well.—Ft., In.	Temp. of Water in Well.—Deg. F.	Depth of Well.—Ft., In.	Depth of Ground above Water in Well.—Ft., In.	Temp. of Water in Well.—Deg. F.	Depth of Well.—Ft., In.	Depth of Ground above Water in Well.—Ft., In.	Temp. of Water in Well.—Deg. F.	Depth of Well.—Ft., In.	Depth of Ground above Water in Well.—Ft., In.	Temp. of Water in Well.—Deg. F.
14 2	10	46^{20}	14 2	10	46 5^{17}	14 2	10	47 5^{17}	14 2	10	50*^{19}	14 2	10	45^{23}	14 2	10	43.5^{14}
----	----	----	----	------	------	--------	------	------	--------	------	------	4	3 5	----	4	2 3⅜	------
13 6	5 6	50^{18}	13 6	5 6	52^{14}	--------	------	50^{17}	--------	------	------	--------	------	----	--------	------	------
20	16 9	46^{16}	20	16 10	49^{17}	20	17 1	50^{18}	20	17 1	48^{17}	--------	------	----	--------	------	------
----	----	----	----	------	------	26 11⅜	24 2¾	50^{16}	26 11⅜	24 2⅜	51^{15}	26 11½	24 5¼	51^{14}	26 11⅜	24 4	49^{17}
----	----	----	----	------	------	--------	------	------	15	13 2	55.5^{16}	15	14 1⅜	52^{5}	15	14 4	48.5^{3}
----	----	----	----	------	------	--------	------	------	--------	14 1	55.5^{22}	--------	14 5	^{13}	--------	14 3	48^{10}
----	----	----	----	------	------	--------	------	------	--------	14 0	55.5^{29}	--------	14 4	^{20}	--------	14 4	47^{17}
----	----	----	----	------	------	--------	------	------	--------	------	------	--------	14 4	^{27}	--------	14 4	46.5^{24}
----	----	----	----	------	------	--------	------	------	--------	------	------	--------	------	----	--------	8 11	40^{31}
----	----	----	----	------	------	--------	------	------	--------	------	------	--------	------	----	--------	------	------
27	20 9	46^{15}	27	22 1	48^{15}	27	23 5	48^{15}	27	25 4	48^{16}	27	24 10	48^{15}	27	24 8	50^{15}
24	4 0	51^{15}	24	2 0	51^{15}	24	2 0	52^{19}	24	9 4	52^{15}	24	8	52^{15}	24	6 6	54^{17}
----	----	----	----	------	------	--------	------	------	--------	------	------	--------	------	----	--------	------	------
40	36	50^{14}	40	36	50^{28}	--------	------	50	--------	------	50	--------	------	50	--------	------	50

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* Increase of temperature of well was caused by surface water filtering in from ground soaked with heavy rains of Oct. 2 and 5.—*Manistique.*

Comments on the subject of a new instrument shelter at Lansing are printed on page 21. Exhibits A, B, C, and D relate to that subject, and may be studied in connection with what is said on page 21. The fact of the change of place of observation in 1884 may need to be taken into account by whoever studies the meteorology at Lansing through a long series of years.

EXHIBIT A.—*Comparison of the Average Temperature for each of the 6 Months, July to December, 1884, by Observations made at the window of the Office of the State Board of Health, with the Average obtained by Observations made at the same time at the new shelter for Meteorological Instruments placed in the Yard, S. W. side of Capitol, showing the effect of the Building on the Instruments by Radiation, Reflection and Protection.*

Months, 1884.	Average Temperature,—Degrees Fahr.						
	Av. 6 Months.	July.	August.	Septemb'r.	October.	November.	December.
Av. at Office Window	53.72	69.77	68.58	67.99	53.47	36.51	26.01
Av. at Shelter for Instruments	52.32	68.76	67.23	65 87	51.84	35.12	25.11
At Office Window **Higher** than at Shelter for Instruments	1.40	1,01	1.35	2.12	1.63	1.39	0.90

EXHIBIT B.—*Comparisons of the Extremes and the Range of Temperature during each of the 6 Months, July to December, 1884, with the Average of the Extremes and of the Range, by Observations made at the new shelter for Meteorological Instruments in the Yard, S. W. side of Capitol, with those obtained by Observations made at the window of the Office of the State Board of Health, at the same Hours, showing the effect of the Building on the Instruments by Radiation and Protection. (Observations made with Registering Thermometers.)*

Months, 1884.	Extremes and Ranges of Temperature.—Degrees F.								
	Observations at Shelter for Instruments.			Observations at Office Window.			Higher (+) or Lower (-) at Shelter for Inst's than at Office Window.		
	Highest.	Lowest.	Range.	Highest.	Lowest.	Range.	Highest.	Lowest.	Range
6 Months	91	-22	113	93	-18	111	-2	-4	+ 2
Av. 6 Months	78	22	56	80	26	54	-2	-3	+ 2
July	89	45	44	88	50	38	+ 1	-5	+ 6
August	91	39	52	93	42	51	-2	-3	+ 1
September	91	38	53	93	43	50	-2	-5	+ 3
October	82	25	57	85	27	58	-3	-2	-1
November	60	9	51	63	9	54	-3	0	-3
December	55	-22	77	55	-18	73	0	-4	+ 4

The above exhibit, B, shows that with three exceptions, in the months of July, November, and December, the maximum and minimum thermometers at the shelter for instruments in the yard registered lower for each extreme than those at the office window.

EXHIBIT C.—*Comparison of the Average Absolute Humidity for each of the six months, July to December, 1884, by observations made at the window of the office of the State Board of Health with the average obtained by observations made at the same time at the new Shelter for Meteorological Instruments placed in the yard, S. W. side of Capitol, showing the effect of the building on the instruments.*

Months, 1884.	Absolute Humidity—Grains of Vapor in a Cubic Foot of Air.						
	Av. 6 Months.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
Averages at office window........	3.96	5.38	5.30	5.30	3.81	2.21	1.76
Av. at shelter for instruments...	4.07	5.48	5.52	5.45	3.86	2.23	1.85
At shelter for instruments—**Greater** than at office window.	.11	.10	.22	.15	.05	.02	.09

EXHIBIT D.—*Comparison of the Average Relative Humidity for each of the six months, July to December, 1884, by observations made at the window of the office of the State Board of Health with the average obtained by observations made at the same time at the new shelter for meteorological instruments placed in the yard, S. W. side of Capitol, showing the effect of the building on the instruments.*

Months, 1884.	Per Cent. of Saturation—Relative Humidity.						
	Av. 6 Months.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
Average at office window..........	71	63	66	66	70	76	82
Av. at shelter for instruments....	76	68	73	73	76	81	86
At Shelter for instruments—**Greater** than at office window.	5	5	7	7	6	5	4

TEMPERATURE.

Compared with the average for the preceding 20 years at the Agricultural College the mean temperature for the months, January to May inclusive, and July, August, and November, was low, and for June, September, and October, it was high. A comparison, by months, of temperature in 1884, with the averages for corresponding months in the preceding 20 years, 1864-83, at the Agricultural College, near Lansing, is given in Exhibit 6, page 27.

The average temperature, by months, for the 6 years, 1879-84, at Lansing, and a comparison of 1884, by months, with that average, are stated in Exhibit 7, page 27.

The average annual and monthly temperature at from 12 to 22 stations for a period of 8 years, 1877-84, is stated in Exhibit 5, page 26; in which is also given, by months, a comparison of 1884 with the average for 1883, and with the average for the 8 years, 1877-84. By Exhibit 5, page 26, which gives averages for groups of several stations in Michigan, it appears that in 1884 the mean temperature in January, April, July, November, and December was lower than in those months in 1883. It also appears that the month of January was much colder than the average temperature of the corresponding month for the 8 years, 1877-84, and June and September, 1884, warmer than the average temperature of the corresponding months for those 8 years.

By Exhibit 10, page 33, it appears that, at the Agricultural College, the lowest temperature reached in January, February, March, and December, 1884, was considerably below the average lowest temperature for the preceding 11 years, and that in the same months, 1884, the range of temperature was much greater than the average range of temperature for the corresponding month in the 11 preceding years, and also the highest and lowest temperatures for 1884 were below the average highest and lowest for those years. The highest and lowest temperatures at the Agricultural College in every month of the 12 years, 1873-84, and comparisons of months in 1884, with the average highest and lowest temperatures by months for the preceding 11 years, are stated in Exhibit 10, page 33.

The average temperature at each of 20 stations in Michigan, and the average for the 20 stations in 1884, and in each month of that year, are stated in Table I, page 28; 7 of the lines in this table are represented in Diagram I., page 29.

The average daily range of temperature at from 6 to 18 stations per year, by months, for a period of 6 years, 1879-84, and a comparison of 1884 with the monthly averages for that period and for 1883, are given in Exhibit 8, page 32. The highest and lowest temperatures in every month in 1884, at each of 21 stations, are stated in Table II., pages 30–31. The average daily range of temperature by months in 1884, at each of 20 stations, and the average for 18 of these stations, are stated in Table III., page 39. The lines for 8 of these stations are represented in Diagram II., page 34. It will be noticed that the greatest average daily range occurred during the month of September.

EXHIBIT 5.—*Average temperature, by year and months, in 1884, compared with annual and monthly averages for the eight years, 1877–1884. These averages are for groups of several stations in Michigan.*

Years, Etc.	Average Temperature.—Degrees Fahr.												
	Annual Av.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
Av. 8 years—1877-84....	46.74	21.43	25.60	31.04	44.48	56.60	65.54	70.68	68.85	62.05	51.34	35.99	27.25
Av. 6 years—1879-84....	46.00	20.85	23.79	30.16	42.81	56.64	65.27	69.73	66.56	61.44	51.30	35.33	26.42
1883 (19 stations)........	43.52	15.78	20.03	24.63	43.00	51.37	64.73	68.36	65.41	57.24	46.73	38.10	26.89
1884 (20 stations)........	44.72	15.14	20.94	28.78	42.00	54.38	67.04	66.70	66.10	64.72	51.56	34.53	24.77
In 1884 **Higher** than Av. 8 years—1877-84..	......	......	......	......	......	......	1.50	......	......	2.67	.22	......	......
In 1884 **Lower** than Av. 8 years—1877-84..	2.02	6.29	4.06	2.26	2.48	2.22	......	3.98	2.75	......	......	1.46	2.48

NOTE.—The stations represented in the lines for average temperature for the years 1877-84 in Exhibit 14, are the following: Thornville, Kalamazoo, Tecumseh and Detroit, for each of the 8 years 1877-84; Mendon for each of the six years, 1877-82; Battle Creek for each of the 4 years, 1877-80, and for 1882; Nirvana for the 3 years 1877-79, and for the first four months of 1880; Reed City for the last 8 months of 1880, and for the 4 years 1881-84; Coldwater, Ypsilanti and Woodmere Cemetery (near Detroit) for 1877-79; Otisville for the three years 1878-80 and for 1882; Niles for 1878, 1879 and 1881; Marquette, Alpena, Grand Haven, Port Huron and Lansing for the 6 years 1879-84; Washington for the 5 years 1879-83; Benton Harbor for 1877 and 1878; Agricultural College for 1877 and for the 4 years 1881-84; Petoskey for 1878 and 1879; Escanaba for the five years 1880-84; Harrisville for 1881 and 1882; Ann Arbor for the 4 years 1881-84; Parkville for 1881 and 1882; Traverse City, Hillsdale and Marshall for the 3 years 1882-84; Winfield for 1881 and 1883; Hudson and Mallory Lake for 1881; Ionia for 1883 and 1884; and Manistique, Mackinaw City and Swartz Creek for 1884.

EXHIBIT 6.—*Comparison of the Average Temperature during the Year and during each Month of the Year, 1884, with the Annual and with the Monthly Averages for the Year 1883, and with the Averages for the twenty Years, 1864-83. Observations made by Prof. R. C. Kedzie, at the State Agricultural College, near Lansing, Mich.*

Years, Etc.	Average Temperature.—Degrees Fahr.												
	Annual Av.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
Av. for 20 y'rs, 1864-83..	46.68	22.43	24.58	31.61	45.71	58.27	67.83	71.63	69.13	60.16	48.33	35.22	25.50
1883....................	43.52	14.39	19.76	24.89	43.48	52.98	65.87	68.94	64.90	56.43	46.17	38.08	26.39
1884....................	45.66	15.46	23.43	29.89	43.66	56.90	68.92	67.95	66.91	65.06	50.91	34.11	24.71
In 1884 **Higher** than Av. 20 years—1864-83.	......	......	......	......	......	......	1.09	......	......	4.90	2.58	......	......
In 1884 **Lower** than Av. 20 years—1864-83.	1.02	6.97	1.15	1.72	2.05	1.37	......	3.68	2.22	......	......	1.11	0.79
In 1884 **Higher** than in 1883..............	2.14	1.07	3.67	5.00	0.18	3.92	3.05	......	2.01	8.63	4.74	......	......
In 1884 **Lower** than in 1883..............	......	......	......	......	......	......	......	0.99	......	......	......	3.97	1.68

EXHIBIT 7.—*Average Temperature, by Year and Months, for the 6 Years, 1879-84. Observations made at Office State Board of Health, State Capitol, Lansing, Michigan.*

Years, Etc.	Average Temperature.—Degrees Fahr.												
	Annual Av.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
Av. 6 years, 1879-84....	48.29	22.45	26.37	32.92	45.80	59.65	67.95	72.62	70.56	63.61	53.20	36.90	27.50
1883....................	45.69	17.01	22.07	28.04	46.42	53.28	66.98	70.42	67.78	59.49	48.31	40.09	28.47
1884....................	47.43	16.48	23.80	32.26	45.30	58.20	70.69	69.77	68.58	67.99	53.47	36.51	26.01
In 1884 **Higher** than Av. for 6 y'rs—1879-84.	......	......	......	......	......	......	2.74	......	......	4.38	.27	......	......
In 1884 **Lower** than Av. for 6 y'rs—1879-84.	.86	5.97	2.48	.66	.50	1.45	......	2.85	1.98	......	......	.39	1.49
In 1884 **Higher** than in 1883..............	1.74	......	1.82	4.22	......	4.92	3.71	......	.80	8.50	5.16	......	......
In 1884 **Lower** than in 1883..............	......	.53	......	......	1.12	......	......	.65	......	......	......	3.58	2.46

TABLE I.—*Average Temperature in Degrees Fahr., for the Year, and for each Month of the Year 1884, at each of 22 Stations in Michigan, and also the Average for 20 of the same Stations. From Observations made Daily at 7 A. M., 2 P. M., and 9 P. M.,* by Observers † for the State Board of Health, and for the U. S. Signal Service.*

Stations in Michigan. † (Those of the U. S. Signal Service in italics.)	Division of the State. ‡	Temperature in Degrees Fahr.													
		Year.		Months, ¶ 1884.											
		Norm. ‖	1884.	Jan.	Feb.	Mar.	Apr.	May.	J'ne.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
Av. for 20 stations. §	....	......	44.72	15.14	20.94	28.78	42.00	54.38	67.04	66.70	66.10	64.72	51.56	34.53	24.77
Marquette	U. P.	^{13}41.97	39.03	10.90	10.20	22.70	35.60	47.20	59.70	59.90	63.00	59.90	47.50	31.30	20.40
Manistique	U. P.	......	40.39	11.82	13.62	23.58	39.07	49.65	60.42	61.82	62.38	59.69	[b] 49.69	30.99	21.90
Escanaba	U. P.	^{13}40.60	39.23	8.70	10.00	21.10	36.30	49.10	62.60	62.60	62.70	60.10	47.50	30.40	19.70
Traverse City	N. W.	^{2}42.12	42.91	14.90	15.84	24.65	38.21	51.17	65.93	65.48	65.34	64.18	50.62	34.08	24.47
Mackinaw City	N.	......	40.65	13.60	13.10	23.00	37.30	47.70	60.90	61.30	62.10	60.60	48.80	34.30	25.10
Alpena	N. E.	^{12}41.50	40.43	12.70	15.20	23.20	37.40	48.40	61.50	61.20	62.00	60.50	48.30	31.60	23.20
Grand Haven	W.	^{13}47.03	46.94	20.90	24.80	32.00	43.70	55.10	67.90	66.90	[a] 65.70	65.40	54.10	38.40	28.40
Reed City	W.	^{7}44.76	43.15	13.39	17.61	26.44	42.07	54.40	68.03	66.90	64.95	61.09	[b] 49.64	31.46	[b] 21.85
Port Austin	B. & E.	......	44.15	[e] 14.92	[d] 21.40	26.49	38.13	52.29	[b] 64.26	65.49	66.77	[b] 66.06	[f] 49.76	36.09	[b] 28.15
Port Huron	B. & E.	^{10}45.34	44.43	15.70	23.50	28.90	39.20	53.30	65.40	64.70	65.80	64.90	51.10	34.70	25.90
Thornville	B. & E.	^{8}48.13	47.74	16.77	24.99	31.30	44.51	59.16	71.58	70.34	69.33	67.88	53.61	36.40	26.96
Agricultural College	C.	^{21}46.64	45.66	15.46	23.43	29.89	43.66	56.90	68.92	67.95	66.91	65.06	50.91	34.11	24.71
Ionia	C.	^{2}44.73	45.66	16.55	22.69	30.16	44.03	56.88	68.57	67.95	65.79	64.93	50.98	34.46	24.93
Lansing	C.	^{6}48.29	47.43	16.48	23.89	32.26	45.30	58.20	70.69	69.77	68.58	67.99	53.47	36.51	26.01
Swartz Creek	C.	......	45.48	15.78	22.86	29.49	43.20	56.59	69.29	67.53	66.35	65.62	50.97	33.80	24.31
Ann Arbor	S. C.	^{4}46.30	45.56	[a] 14.90	[c] 24.10	[c] 30.90	[e] 43.90	[e] 52.20	[e] 68.30	68.98	67.10	65.40	51.80	34.40	24.70
Battle Creek	S. C.	^{2}48.51	49.30	20.06	26.86	34.82	46.89	59.04	71.28	71.54	69.82	68.97	56.06	[b] 39.10	27.19
Hillsdale	S. C.	^{2}46.13	47.01	[b] 14.98	25.37	32.33	44.54	57.86	69.60	69.92	68.57	67.67	53.28	35.32	24.69
Kalamazoo	S. C.	^{8}48.02	47.36	16.00	25.08	33.08	45.66	57.88	69.56	68.56	67.31	68.10	54.26	36.74	26.03
Marshall	S. C.	^{2}47.70	48.63	17.02	26.57	33.81	46.80	59.54	71.79	71.42	69.65	69.08	54.19	36.92	26.72
Tecumseh	S. C.	^{8}47.65	47.05	14.77	25.37	[c] 31.15	44.12	57.51	[b] 69.75	[b] 70.91	[e] 69.04	67.82	[e] 54.13	[b] 35.09	24.92
Detroit	S. E.	^{13}48.39	49.71	21.40	30.64	35.60	45.50	58.90	70.40	69.90	69.40	68.40	56.30	39.60	30.50

[a], [b], [c]. In the columns from January to December, inclusive, the letters [a], [b], [c], etc., stand directly above the numbers from which they refer to the notes below.

[a] For 30 days. [b] For 29 days. [c] For 28 days. [d] For 27 days. [e] For 25 days. [f] For 24 days.

* At the U. S. Signal Service Stations for the year 1884, the observations were made at 7 A. M., 3 P. M., and 11 P. M., Washington mean time, and one-third the sum of the three observations was taken as the daily average. The local time at these stations corresponding to 7 A. M., 3 P. M., and 11 P. M., Washington time, is as follows: At Port Huron, 6:38 A. M., 2:38 P. M., and 10:38 P. M.; at Detroit, 6:36 A. M., 2:36 P. M., and 10:36 P. M.; at Alpena, 6:34 A. M., 2:34 P. M., and 10:34 P. M.; at Grand Haven, 6:23 A. M., 2:23 P. M., and 10:23 P. M.; at Mackinaw City, 6:22 A. M., 2:22 P. M., and 10:22 P. M.; at Escanaba, 6:20 A. M., 2:20 P. M., and 10:20 P. M.; at Marquette, 6:19 A. M., 2:19 P. M., and 10:19 P. M. At the other stations the observations were made at 7 A. M., 2 P. M., and 9 P. M., local time; and the daily averages were one-third the sum of these three observations.

† The names of observers, their places of observation, and the counties in which these places are situated, are stated in Exhibit 1, page 6.

‡ The names of divisions, and the counties in each are stated in Exhibit I., in a paper which follows on weekly reports of sickness.

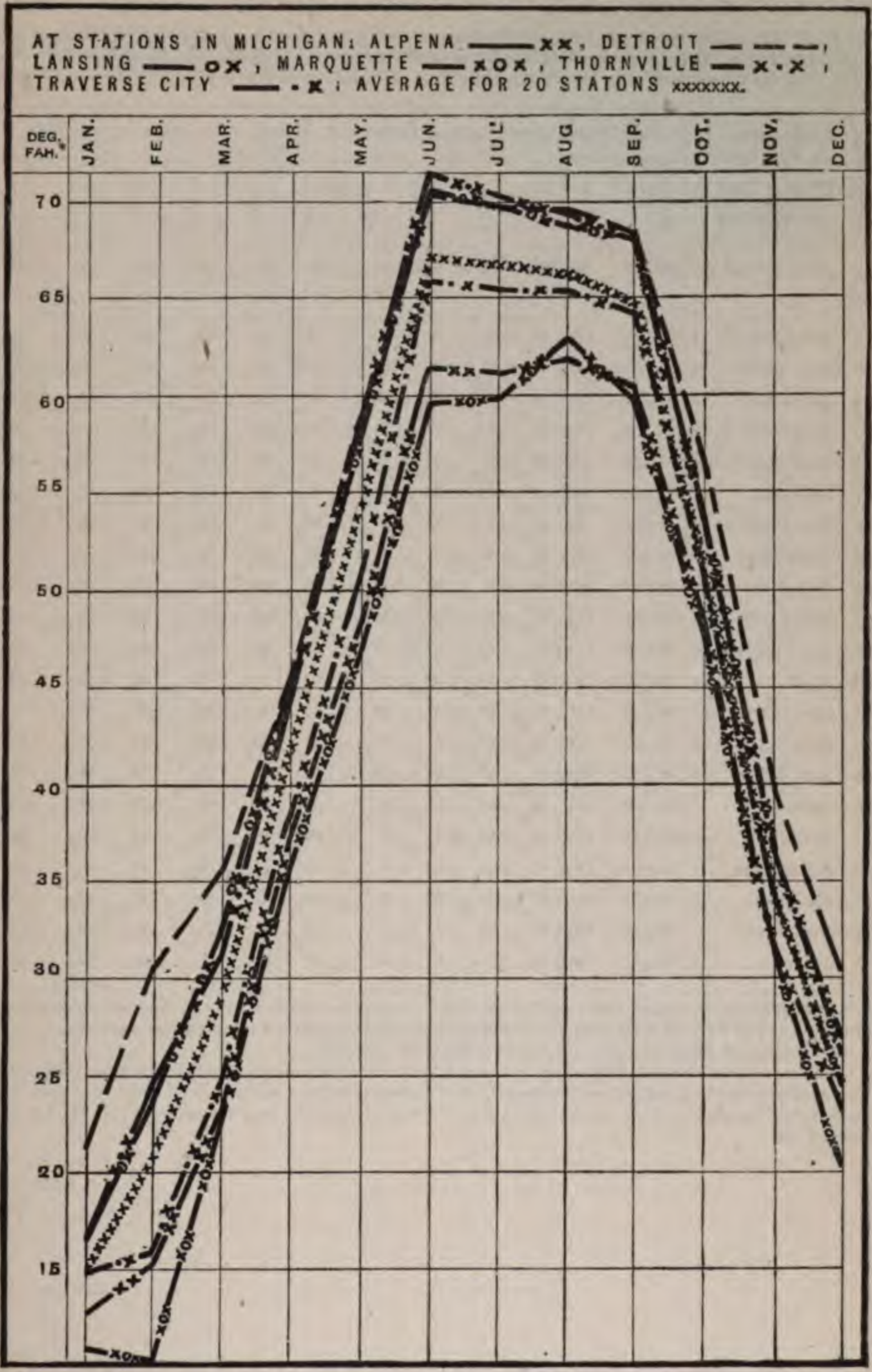
§ This line is an average for only the 20 stations from which statements nearly complete were received for every month of the year. It does not include Battle Creek or Port Austin.

‖ Numbers in this column state the average annual temperature for periods of years ending in each case with Dec. 31, 1884. The small figures above and at the right of numbers which state the temperature, denote the number of years included in the average.

¶ The computations of Av. Temp., as tabulated for months in 1884, were made at the following stations: Marquette, Escanaba, Grand Haven, Detroit, Ann Arbor, Alpena, Port Huron and Ionia. All other computations in Table I. were made at the office of the Secretary of State and the State Board of Health.

The lines for 6 representative stations in Table I. are graphically represented in Diagram I., page *29.*

DIAGRAM I.—AVERAGE TEMPERATURE. BY MOS., IN 1884.



*SCALE, 10° F. TO 1.04 IN. VERTICALLY.

H. B. T., DEL. DES. BY H. B. B.

TABLE II.—*Extremes of Temperature and Days of Month on which the Highest and for the Year 1884, at each of 21 Stations in Michigan.—As indicated by Daily Readings P. M., by Observers* for the State Board of Health, and for the U. S. Signal Service.*

Line Number.	Stations in Michigan.* (Those of the U. S. Signal Service in Italics.)	Year 1884.			January.		February.		March.		April.		May.	
		Highest.	Lowest.	Range.	Highest.	Lowest.	Highest.	Lowest.	Highest.	Lowest.	Highest.	Lowest.	Highest.	Lowest.
1	At 21 Stations...	105	-33	138	52	-33	64	-31	65	-27	80	17	84	27
2	*Marquette*......§	91	-20	111	45^{17}	-19^{24}	39^{19}	-20^{15}	56^{24}	-16^{1}	69^{26}	18^{1}	73^{30}	31^{28}
3	Manistique ....‡	88	-27	115	43^{17}	-21^{24}	37^{17}	-27^{29}	62^{28}	-26^{1}	65^{23}	17^{6}	79^{26}	30^{27}
4	*Escanaba*.......§	81	-29	110	38^{30}	-18^{4}	38^{19}	-29^{29}	53^{28}	-27^{1}	60^{24}	19^{6}	71^{30}	31^{2}
5	Traverse City..‡	93	-23	116	39^{30}	-22^{21}	45^{19}	$-19^{28,29}$	54^{28}	-23^{1}	75^{30}	$17^{5,6}$	78^{31}	30^{28}
6	*Mackinaw City*‡	89	-20	109	40^{17}	-16^{24}	39^{19}	-17^{28}	52^{11}	-20^{2}	66^{27}	19^{6}	73^{31}	$33^{2,3}$
7	*Alpena*..........§	91	-20	111	41^{30}	-20^{25}	38^{19}	-17^{29}	54^{21}	-19^{2}	65^{25}	21^{6}	80^{23}	30^{3}
8	*Grand Haven*..§	84	-12	96	43^{29}	-9^{24}	51^{19}	-2^{29}	60^{27}	6^{2}	72^{30}	29^{6}	75^{22}	37^{2}
9	Reed City ......†	94	-33	127	42^{30}	-33^{23}	49^{19}	-31^{28}	60^{27}	-25^{3}	$71^{26,27}$	$19^{5,6}$	81^{22}	27^{28}
10	*Port Huron*....§	92	-15	107	48^{30}	-11^{25}	57^{19}	-15^{29}	60^{23}	-6^{2}	69^{27}	27^{7}	80^{23}	32^{29}
11	Thornville .....‡	93	-19	112	47^{30}	-19^{25}	54^{19}	-12^{29}	60^{23}	-12^{2}	71^{26}	$26^{6,7}$	83^{23}	34^{29}
12	Agr'l College...‡	90	-25	115	44^{30}	-22^{24}	52^{19}	-18^{28}	57^{27}	-13^{1}	74^{30}	21^{5}	$80^{21,23}$	28^{28}
13	Ionia ....‡	92	-25	117	45^{30}	-25^{24}	50^{19}	-18^{28}	60^{27}	-8^{3}	78^{30}	26^{4}	81^{21}	32^{28}
14	Lansing S. B. of H.‡	93	-18	111	47^{30}	-13^{24}	56^{19}	-13^{28}	64^{27}	$-9^{1,2}$	$76^{27,30}$	25^{5}	82^{21}	34^{28}
15	Swartz Creek ..‡	91	-27	118	49^{30}	-25^{24}	61^{19}	-16^{28}	57^{23}	-15^{1}	69^{30}	24^{6}	81^{23}	28^{28}
16	Ann Arbor.....†	89	-17	106	49^{30}	-17^{5}	57^{19}	-12^{29}	57^{28}	-8^{9}	72^{27}	23^{6}	79^{23}	30^{29}
17	Battle Creek...‡	105	-20	125	48^{30}	-10^{24}	55^{19}	-6^{28}	58^{27}	4^{4}	80^{30}	$28^{5,8}$	84^{31}	40^{28}
18	Hillsdale.......‡	95	-20	115	49^{30}	-20^{4}	54^{19}	$-7^{27,28}$	60^{24}	-9^{1}	76^{30}	22^{5}	80^{23}	31^{28}
19	Kalamazoo ....†	95	-15	110	47^{30}	-15^{5}	50^{19}	-4^{28}	65^{27}	3^{1}	79^{30}	$27^{5,7}$	82^{21}	35^{15}
20	Marshall.......‡	93	-18	111	47^{30}	-17^{4}	53^{19}	-8^{28}	60^{27}	2^{3}	80^{30}	27^{2}	82^{23}	33^{28}
21	Tecumseh......‡	95	-25	120	45^{30}	-25^{24}	55^{19}	-7^{28}	63^{27}	-2^{9}	75^{27}	22^{5}	82^{21}	30^{28}
22	*Detroit*..........§	90	-6	96	52^{30}	-6^{5}	64^{19}	-6^{29}	62^{23}	3^{2}	71^{28}	30^{6}	81^{21}	36^{29}

NOTE.—The small figures above and at the right of numbers denoting the degrees of temperature state the day or days of the month on which the highest or the lowest temperature occurred.

* The names of observers, etc., are stated in Exhibit 1, page 6.

† The extremes for Reed City from January 1 to 13 were determined from readings of minimum thermometer and dry bulb of psychrometer. For Kalamazoo from September 12 to December 31, and Ann Arbor December 1 to 11, from readings of the dry bulb of the psychrometer at 7 A. M., 2 P. M., and 9 P. M.

the Lowest Temperature occurred, by Months of the Year 1884; Also Extremes and Range of Registering Thermometers, or by Observations made Daily at 7 A. M., 2 P. M., and 9

June.		July.		August.		September.		October		November.		December.		Line Number.
Highest.	Lowest.	Highest.	Lowest.	Highest.	Lowest.	Highest.	Lowest.	Highest.	Lowest.	Highest.	Lowest.	Highest.	Lowest.	
95 29	37 10	93 22	37 8	102 20	34 12	105 6	30 22	96 18	20 23	75 14	-6 24	60 3,4	-27 17	1
91 12	37 9	86 20	43 1	90 14	35 23	89 9	38 22	82 3	20 22	64 14	-6 23	47 4	-16 25	2
83 19	38 16	82 20	41 11	84 11	34 8	88 4	35 20	81 3	23 25	62 14	-1 24	48 4	-19 26	3
81 30	43 10	79 22	46 18	81 20	40 7	79 19	41 20	78 3	22 23	63 9	-5 24	46 6	-14 26	4
90 29	44 15	91 22	48 17	93 29	41 8	91 10	41 23	81 3	26 25	58 9	8 24	47 29	-14 18	5
81 30	44 11	78 1	47 14	80 20	42 9	89 9	42 23	79 3	28 24	57 14	12 21	48 31	-5 19	6
85 22	40 26	83 3	45 16	91 17	39 8,10	93 6	35 21	84 5	21 25	58 9	10 21	50 30	-10 26	7
84 24	49 11	81 22	52 19	83 15,16,17	45 7	82 9	39 20	76 3	29 23	59 17	12 29	59 30	-12 25	8
89 23	37 11	89 1	37 17	90 17	35 8	94 10	30 19	82 3	21 23	57 9,10	5 25	53 31	-27 19	9
87 17	47 26,27	87 1,22	47 8,9	92 18	47 9,10	92 7,9	39 18	84 3	27 30	57 23	11 24	56 31	-11 20	10
92 23	50 25	90 22	48 13	93 17,19,20	44 7	92 5	40 20	84 3	26 28	60 9	12 28	53 30	-14 1	11
89 21,23	43 25	89 22	44 13	90 17,20	36 9	89 10	36 20	81 3	22 23,28,29	59 9	10 23	53 30	-25 18	12
89 30	44 25	91 22	45 13	92 17	41 7,8	92 9	35 17	83 3	25 23	59 9,15	9 23,24	52 30	-24 18	13
89 17	47 25	88 22	50 7	93 17	42 8	93 9	43 18	85 3	27 23	63 16	9 21	55 30	-18 18	14
88 23	43 26	87 22	45 14	90 17	37 8	91 10	36 20	83 3	23 23	58 10	10 23	54 30	-27 18	15
88 23	45 9	87 2	47 13	88 15	42 23	89 9	43 13	82 4	28 28	58 10	12 24	53 4	-14 18	16
95 18	52 25	92 22	47 13	102 17	41 8	105 9,10	40 20	96 3,4	28 23	75 16	9 23	58 30	-20 18	17
95 30	47 25	89 22	47 13,15	93 16	39 7,8	93 9	38 21	83 5	23 24	60 9	7 24	54 30	-19 19	18
90 22	47 25	90 22	51 13	92 17	45 7,8	95 9	48 18	81 3	32 23	60 9	14 23,24	49 30	-9 18	19
92 23	48 25	90 1	48 8,19	93 17	42 7	94 6,7	41 20	84 4	26 23,28	60 11	12 30	55 6	-18 18	20
93 23	48 26	93 1	46 8	95 18,20	42 9	94 10	34 21	88 3	23 24	68 23	5 24	54 6	-21 19	21
90	48	89	51	90	46	89	45	85	28	62	14	60	-6	22

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‡ For stations marked thus ‡, and for Reed City, Ann Arbor, and Kalamazoo, the daily readings of registering thermometers were recorded at 7 A. M. for the preceding calendar day.

§ At the stations of the U. S. Signal Service the observations with registering thermometers were read and recorded at 11 P. M.

EXHIBIT 8.—*Average Daily Range of Temperature, by Year and Months in 1884, compared with Annual and Monthly Averages for the 6 Years, 1879-84. These Averages are for Groups of several Stations in Michigan.*

Years, Etc.	Average Daily Range of Temperature.—Degrees Fahr.												
	Annual Av.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
Av. for 6 y'rs, 1879-84*	18.17	16.67	17.58	17.67	19.49	20.85	20.04	19.83	20.09	19.77	17.56	15.15	13.31
1883—(16 Stations*)	18.92	17.64	18.38	21.44	19.64	20.21	19.13	19.06	22.65	21.68	15.70	16.34	15.13
1884—(18 Stations*)	19.01	17.72	17.79	19.88	19.22	19.50	21.90	20.83	21.27	20.87	18.69	16.37	14.09
In 1884 **Greater** than Av. 6 years, 1879-84	.84	1.05	.21	2.21	......	......	1.86	1.00	1.18	1.10	1.13	1.22	.78
In 1884 **Less** than Av. 6 years, 1879-84	......	......	......	......	.27	1.35	......	......	......	......	......	......	......
In 1884 **Greater** than in 1883	.09	.08	......	......	......	......	2.77	1.77	......	......	2.99	.03	......
In 1884 **Less** than in 1883	......	......	.59	1.56	.42	.71	......	......	1.38	.81	......	......	1.04

*Marquette, Grand Haven, Lansing, and Detroit for the 6 years, 1879-84; Otisville for 1879, 1880, and 1882; Battle Creek for 1879 and 1880; Escanaba, Alpena, Port Huron, and Thornville for the 5 years, 1880-84; Kalamazoo for the 4 years, 1880-83; Adrian for 1880; Agricultural College for the 4 years, 1881-84; Traverse City and Marshall for the 3 years, 1882-84; Harrisville for 1882; Reed City for 1882 and 1884; Ann Arbor and Washington for 1882 and 1883; Winfield for 1883; Tecumseh for 1883 and 1884; Manistique, Mackinaw City, Ionia, Swartz Creek, and Hillsdale for 1884.

EXHIBIT 9.—*Comparisons of the Average Daily Range of Temperature for the Year and for each Month of the Year, 1884, with Averages for the 10 Years, 1874-83, and for the Year 1883. Observations made with Registering Thermometers by Prof R. C. Kedzie, at the State Agricultural College, near Lansing, Michigan.*

Years, Etc.	Average Daily Range of Temperature.—Degrees Fahr.												
	Annual Av.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
Av. 10 years, 1874-83*	21.26	16.93	19.27	19.32	23.10	25.44	23.45	25.01	26.35	24.63	20.61	16.24	14.83
1883	20.42	17.90	19.00	21.81	21.83	22.19	19.83	19.42	25.90	25.70	18.06	17.90	15.52
1884	20.30	16.84	16.17	19.35	21.33	22.45	24.60	24.77	24.39	22.73	20.11	16.67	14.20
In 1884 **Greater** than Av. for 1874-83	......	......	......	.03	......	......	1.15	......	......	......	......	.43	......
In 1884 **Less** than Av. for 1874-83	.96	.09	.10	......	1.77	2.99	......	.24	1.96	1.90	.50	......	.63
In 1884 **Greater** than in 1883	......	......	......	......	......	.26	4.77	5.35	......	......	2.05	......	......
In 1884 **Less** than in 1883	.12	1.06	2.83	2.46	.50	......	......	......	1.51	2.97	......	1.23	1.32

*For the years 1874-6, 1878, 1879 (except Nov. and Dec.), and 1880, the computations were made from the report of observations published in the Reports of the State Board of Agriculture for those years. For 1877, 1881 (except Jan.), 1882, 1883, and 1884, the computations were made from registers or copies of registers supplied by Dr. Kedzie.

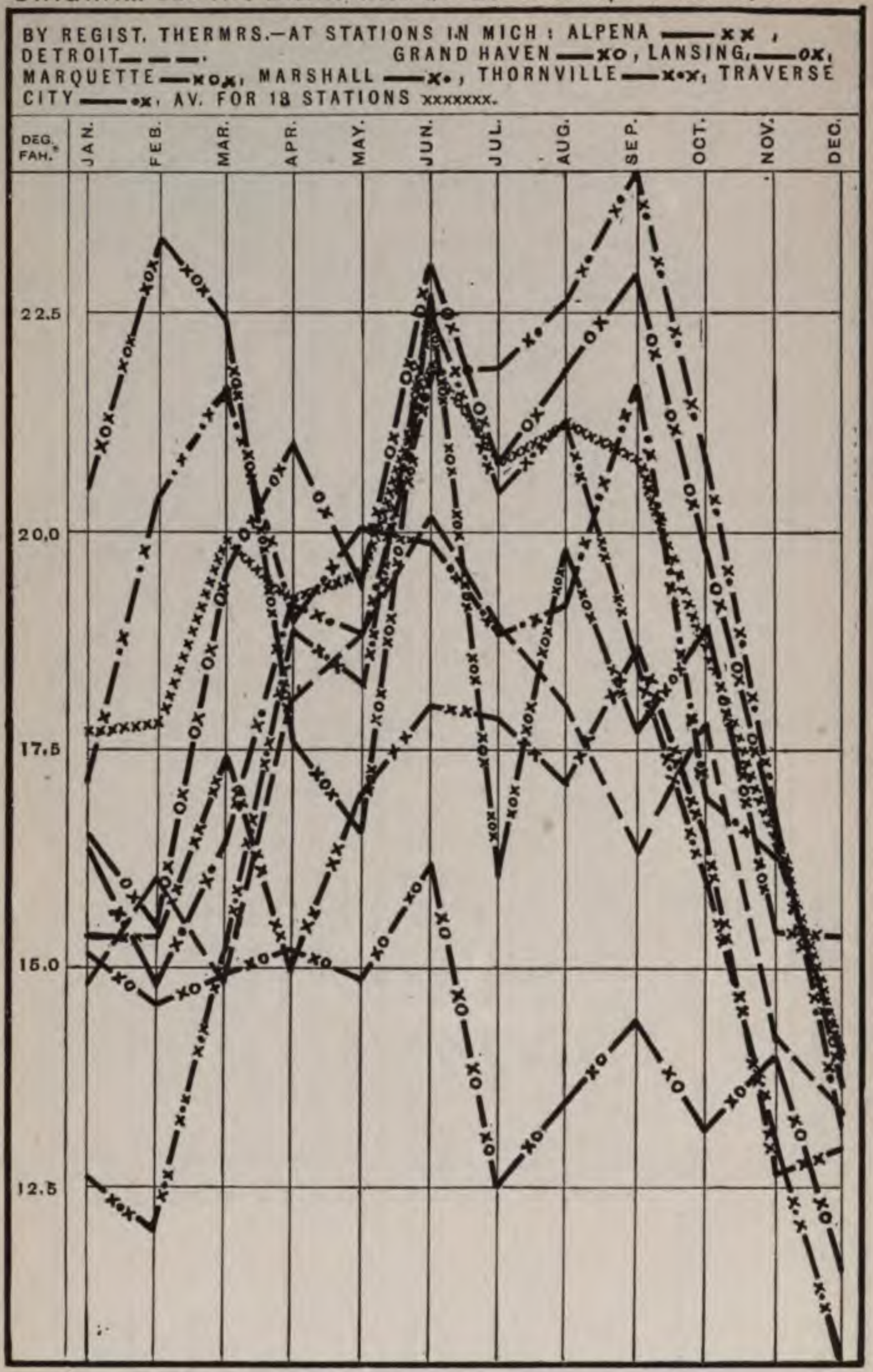
EXHIBIT 10.—*Comparisons of the Extremes and the Range of Temperature (Degrees Fahr.) during the Year, and during each month of the Year 1884, with the Average of the Extremes, and of the Range, for the Eleven Years, 1873–83; also, Statement of the Extremes and of the Range for each of the Eleven Years, 1873–83. Observations made with Registering Thermometers (except for the first two months of 1873, and for those two months with an ordinary Thermometer, at 7 A. M., 2 P. M., and 9 P. M.) Daily, by Prof. R. C. Kedzie, at the State Agricultural College, near Lansing, Mich. For Nov. and Dec., 1879, the observations were made by Harry B. Turner, at the Office of the State Board of Health, Lansing.*

Extremes and Ranges of Temperature.—Degrees F.

Year and Months.	1873.			1874.			1875.			1876.			1877.			1878.			1879.			1880.			1881.			1882.			1883.			Av. for 11 years, 1873–83.			1884.*			1884 Higher (+), or lower (–), than Av. 11 yrs, 1873–83.		
	Highest.	Lowest.	Range.	Highest.	Lowest.	Range.	Highest.	Lowest.	Range.	Highest.	Lowest.	Range.	Highest.	Lowest.	Range.	Highest.	Lowest.	Range.	Highest.	Lowest.	Range.	Highest.	Lowest.	Range.	Highest.	Lowest.	Range.	Highest.	Lowest.	Range.	Highest.	Lowest.	Range.	Highest.	Lowest.	Range.	Highest.	Lowest.	Range.	Highest.	Lowest.	Range.
Year	94	-30	124	101	-7	108	94	-33	127	96	-19	115	93	-14	107	98	-7	105	97	-18	115	94	-17	111	100	-17	117	89	-10	99	91	-20	111	95	-17	112	90	-25	115	-5	-8	+3
Av. Month	74	15	59	77	15	62	75	10	64	74	19	56	74	20	54	73	22	51	76	15	61	74	20	54	73	22	52	72	23	49	71	14	57	74	18	56	71	14	58	-3	-4	+2
January	43	-30	73	59	-7	66	35	-13	48	65	6	59	52	-9	61	48	-4	52	44	-18	62	62	9	53	37	-9	46	50	-2	52	41	-19	60	49	-9	57	44	-22	66	-5	-13	+9
February	49	-13	62	48	-1	49	42	-33	75	59	-1	60	56	10	46	55	-7	62	41	-6	47	59	-2	61	48	-17	65	57	12	45	50	-20	70	51	-7	58	52	-18	70	+1	-11	+12
March	57	-12	69	67	8	59	75	-11	86	60	0	60	51	-14	65	72	18	54	66	4	62	55	6	49	50	9	41	66	16	50	52	-8	60	61	1	60	57	-13	70	-4	-14	+10
April	82	24	58	68	3	65	80	0	80	74	16	58	81	18	63	75	29	46	81	12	69	76	20	56	83	9	74	73	21	52	83	14	69	78	15	63	74	21	53	-4	+6	-10
May	84	27	57	96	21	75	89	24	65	89	31	58	90	26	64	77	29	48	91	25	66	87	40	47	89	33	56	79	28	51	80	31	49	86	29	58	80	28	52	-6	-1	-6
June	94	42	52	95	34	61	89	33	56	95	42	53	89	40	49	94	39	55	95	33	62	92	41	51	86	40	46	87	44	43	87	42	45	91	39	52	89	43	46	-2	+4	-6
July	92	44	48	98	43	55	92	44	48	96	46	50	91	43	48	98	47	51	97	47	50	94	50	44	95	52	43	89	47	42	90	45	45	94	46	48	89	44	45	-5	-2	-3
August	94	44	50	101	41	60	93	35	58	96	36	60	93	43	50	93	42	51	96	34	62	88	43	45	100	46	54	89	49	40	91	32	59	94	40	54	90	36	54	-4	-4	—
September	89	26	63	95	30	65	94	26	68	80	36	44	85	38	47	92	31	61	85	27	58	88	30	58	97	43	54	85	32	53	86	28	58	89	32	57	89	36	53	—	+4	-4
October	79	16	63	76	16	60	77	18	59	75	19	56	87	26	61	82	21	61	87	15	72	76	24	52	75	30	45	77	24	53	77	22	55	79	21	58	81	22	59	+2	+1	+1
November	56	1	55	70	3	67	60	2	58	62	12	50	55	4	51	52	15	37	75	13	62	62	-4	66	64	12	52	70	14	56	63	7	56	63	7	55	59	10	49	-4	+3	-6
December	64	10	54	50	-6	56	70	-1	71	41	-19	60	58	13	45	36	-2	38	58	-3	61	47	-17	64	56	12	44	40	-10	50	55	-2	57	52	-2	55	53	-25	78	+1	-23	+23

* For the twelve years, 1873–84, the highest temperature was 101°, August 11, 1874: the west was -33°, February 8, 1875, and the range was 134°, F.

DIAGRAM II.—AV. DAILY RANGE OF TEMP., BY MOS., 1884.



*SCALE; 5° F. RANGE TO 2.34 IN. VERTICALLY.

H. B. T., DEL.

DES. BY H. B. B.

TABLE III.—*Average Daily Range of Temperature, by Registering Thermometers, during the Year and during each Month of the Year 1884, at each of 20 Stations in Michigan, and Average for 18 of the same Stations.*

Stations in Michigan.* (Those of the U. S. Signal Service in Italics.)	Divisions of the tate. †	Norm. ‡	Average Daily Range of Temperature.—Degrees Fahr.												
			Yr., 1884.	Months, 1884.											
				Jan.	Feb.	Mar.	Apr.	May.	June	July.	Aug.	Sept.	Oct.	Nov.	Dec.
Average for 18 Stations	....	......	19.01	17.72	17.79	19.88	19.22	19.50	21.90	20.83	21.27	20.87	18.69	16.37	14.09
Marquette	U. P.	17.79^{6}	18.87	20.50	23.36	22.42	17.61	16.55	22.72	16.10	19.78	17.70	18.89	15.43	15.40
Manistique	U. P.	......	23.06	28.10	30.03	30.85	22.58	20.58	21.77	21.16	22.37	21.60	[f] 20.43	21.70	15.55
Escanaba	U. P.	16.55^{5}	16.89	18.61	19.10	22.74	16.80	16.48	18.20	17.56	15.78	14.24	15.17	15.07	12.87
Traverse City	N. W.	18.12^{8}	18.75	17.16	20.45	21.65	18.92	20.06	19.87	18.81	19.13	21.70	16.97	16.33	13.97
Mackinaw City	N.	......	15.28	16.66	17.92	18.98	15.26	14.98	16.87	14.73	15.77	16.30	13.70	11.58	10.62
Alpena	N. E.	16.24^{5}	16.16	15.34	15.35	17.44	14.94	16.95	18.03	17.87	17.10	[b] 18.71	16.59	12.65	12.96
Grand Haven	W.	13.64^{6}	14.19	15.18	14.59	14.92	15.20	14.85	16.25	12.51	13.50	14.41	13.19	14.04	11.59
Reed City	W.	......	24.67	19.61	21.76	28.61	25.40	26.32	30.53	29.10	27.94	27.57	[a] 21.83	20.57	[a] 16.83
Port Huron	B. & E.	16.02^{5}	16.27	15.36	15.16	14.46	[b] 13.36	17.68	19.26	17.48	18.59	18.30	17.57	14.53	13.43
Thornville	B. & E.	16.96^{5}	16.60	12.62	12.03	15.20	18.87	18.26	22.57	20.48	21.32	18.50	15.97	12.90	10.48
Agricultural College	C.	20.04^{3}	20.30	16.84	16.17	19.35	21.33	22.45	24.60	24.77	24.39	22.73	20.11	16.67	[a] 14.20
Ionia	C.	......	21.68	18.23	16.36	[b] 20.59	22.68	23.02	[b] 24.88	25.92	25.98	[b] 25.71	22.10	[b] 18.50	16.24
Lansing	C.	19.45^{6}	19.23	16.55	15.48	19.55	21.03	19.32	23.07	20.81	21.84	22.97	19.77	16.67	13.65
Swartz Creek	C.	......	19.92	[a] 18.93	17.55	19.58	19.77	19.13	23.90	22.77	22.97	22.30	19.45	16.70	15.97
Ann Arbor	S. C.	18.95^{3}	19.19	19.26	16.73	[b] 16.81	[d] 21.53	[e] 23.04	23.79	22.27	21.80	18.16	18.27	14.69	13.94
Hillsdale	S. C.	......	21.67	[b] 18.90	18.10	20.19	[c] 22.02	22.65	23.33	25.55	26.98	25.20	21.89	19.10	16.16
Kalamazoo	S. C.	18.26^{5}	16.82	16.37	15.21	17.57	20.28	18.92	22.70	21.45	22.00	18.23	§ 11.65	10.33	7.10
Marshall	S. C.	19.01^{2}	18.91	16.39	14.79	16.45	19.17	18.81	21.83	21.87	22.65	24.10	20.81	16.80	13.23
Tecumseh	S. C.	22.93^{2}	22.96	19.19	15.97	[a] 20.07	22.93	24.10	[b] 26.34	28.52	[c] 28.68	27.17	24.10	21.20	17.19
Detroit	S. E.	15.80^{6}	16.79	14.80	16.09	14.80	18.09	18.81	20.19	18.92	18.03	16.42	17.83	14.18	13.36

NOTE.—Graphic representations of statements in Table III, are given in Diagram No. II, page 34.

* The names of observers, their places of observation, and the counties in which these places are situated, are stated in Exhibit 1, page 6. The † foot note to Table II applies to Table III above.

† For counties in each division see Exhibit 1, in a paper which follows on weekly reports of diseases.

‡ Numbers in this column state the annual average range of temperature for periods of years ending in each case with Dec. 31, 1884. The small figures above and at the right of numbers which state the range of temperature, denote the number of years included in the average.

§ The range of temperature at Ann Arbor and Kalamazoo having been determined from the 7 A. M., 2 P. M. and 9 P. M. observations for a portion of the year 1884, has not been included in the average with the other 18 stations.

[a], [b], [c]. In the columns from January to December, inclusive, the letters [a], [b], [c], etc., stand directly above the numbers from which they refer to the notes below.

[a] For 30 days. [b] For 29 days. [c] For 28 days. [d] For 27 days. [e] For 24 days. [f] For 23 days.

ABSOLUTE HUMIDITY.

The quantity of invisible vapor of water in the air varies from several causes, but mainly with the temperature, the warmer the outdoor air the greater the amount of water it may contain, and usually the greater amount it does contain.

TABLE IV.—ABSOLUTE HUMIDITY.—*The Average Number of Grains of Vapor of Water in a Cubic Foot of Air for Months and Year 1884, at 19 Stations in Michigan.—Average of Observations made Daily at 7 A. M., 2 P. M., and 9 P. M.,* by Observers† for the State Board of Health, and for the U. S. Signal Service.*

Stations in Michigan.† (Those of U. S. Signal Service in italics.)	Divisions of the State.‡	Grains of Vapor in a Cubic Foot of Air—(Absolute Humidity.)													
		Year.		Months, 1884.											
		Norm. §	1884.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
Av. for 19 stations..	....	......	3.31	1.09	1.37	1.77	2.42	3.78	5.59	5.40	5.52	5.24	3.72	2.11	1.69
Marquette..........	U. P.	2.73[6]	2.65	0.77	0.80	1.32	1.95	2.91	4.22	4.42	4.94	[c]4.47	3.00	[e]1.70	1.35
Manistique..........	U. P.	......	3.05	1.02	1.16	1.53	2.25	3.38	4.75	5.11	5.41	4.83	[l]3.56	2.03	1.59
Escanaba..........	U. P.	2.91[5]	2.85	0.84	[f]0.84	[b]1.33	2.02	3.12	4.90	4.74	5.17	4.84	3.23	1.79	1.32
Traverse City.......	N. W.	3.38[8]	3.39	1.20	1.27	1.68	2.47	3.73	5.73	5.61	[a]5.56	5.50	3.82	2.26	1.82
Mackinaw City......	N.	......	2.93	[a]0.99	1.02	1.43	2.13	3.11	4.88	4.72	5.09	4.80	3.31	2.08	1.65
Alpena..........	N. E.	2.93[6]	2.88	0.80	0.99	1.37	2.06	3.15	4.90	4.68	4.97	4.68	[a]3.30	2.04	[b]1.58
Grand Haven.......	W.	3.53[6]	3.46	1.25	1.46	1.94	2.57	3.76	5.56	5.62	5.55	5.53	4.03	2.35	1.90
Reed City..........	W.	3.12[7]	2.95	0.85	1.04	1.49	2.26	3.55	5.23	5.10	4.95	4.71	[c]3.38	1.58	[e]1.25
Port Huron.........	B. & E.	3.36[6]	3.47	1.09	1.49	1.79	2.42	3.70	5.34	5.30	7.32	5.42	3.77	2.24	1.77
Thornville..........	B. & E.	3.76[8]	3.73	1.34	1.79	2.09	2.72	4.43	6.31	5.91	5.91	5.85	4.10	2.36	1.97
Agr'l College.......	C.	3.58[5]	3.57	1.28	[g]1.67	2.01	2.58	4.17	6.09	5.94	5.67	5.52	[a]3.87	2.19	1.84
Ionia..........	C.	......	3.49	1.27	1.62	1.96	2.59	4.11	5.95	5.68	5.44	5.46	3.86	2.14	1.83
Lansing..........	C.	3.42[6]	3.38	1.14	1.49	1.87	2.54	3.95	5.81	5.38	5.30	5.30	3.81	2.21	1.76
Swartz Creek.......	C.	......	3.37	1.12	1.45	1.81	2.51	3.96	5.87	5.43	5.30	5.28	3.74	[d]2.11	[g]1.84
Ann Arbor ‖.........	S. C.	3.43[4]	3.41	[m]1.10	[k]1.22	[h]1.74	[j]2.31	[l]3.94	[i]6.19	5.98	6.00	5.17	3.70	1.99	1.63
Hillsdale..........	S. C.	3.38[3]	3.42	[e]1.02	1.52	1.86	2.53	4.17	6.06	5.66	5.29	5.29	3.88	2.13	1.60
Marshall..........	S. C.	3.65[3]	3.71	1.16	1.70	2.18	2.80	4.38	6.43	5.96	5.78	5.74	4.20	2.33	[b]1.80
Tecumseh..........	S. C.	3.66[7]	3.62	1.18	1.74	[d]2.05	2.67	4.31	[c]6.24	[b]5.76	[j]5.62	5.62	[e]4.22	[c]2.28	1.79
Detroit..........	S. E.	3.54[8]	3.55	1.24	1.84	2.11	2.62	3.97	5.81	5.53	5.63	5.63	3.96	2.36	1.90

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[a], [b], [c]. In the columns from January to December, inclusive, the letters, [a], [b], [c], stand directly above the numbers from which they refer to the notes below.

[a] For 92 observations. [b] For 91 observations. [c] For 89 observations. [d] For 88 observations.
[e] For 87 observations. [f] For 86 observations. [g] For 85 observations. [h] For 83 observations.
[i] For 81 observations. [j] For 80 observations. [k] For 79 observations. [l] For 72 observations.
[m] For 69 observations.

* At the U. S. Signal Service stations for the year 1884, the observations were made at 7 A. M., 3 P. M., and 11 P. M., Washington mean time. The local time corresponding to these hours is stated in the star (*) footnote to table I., page 28.

† The names of observers, their places of observation, and the counties in which these places are situated are stated in Exhibit 1, page 6.

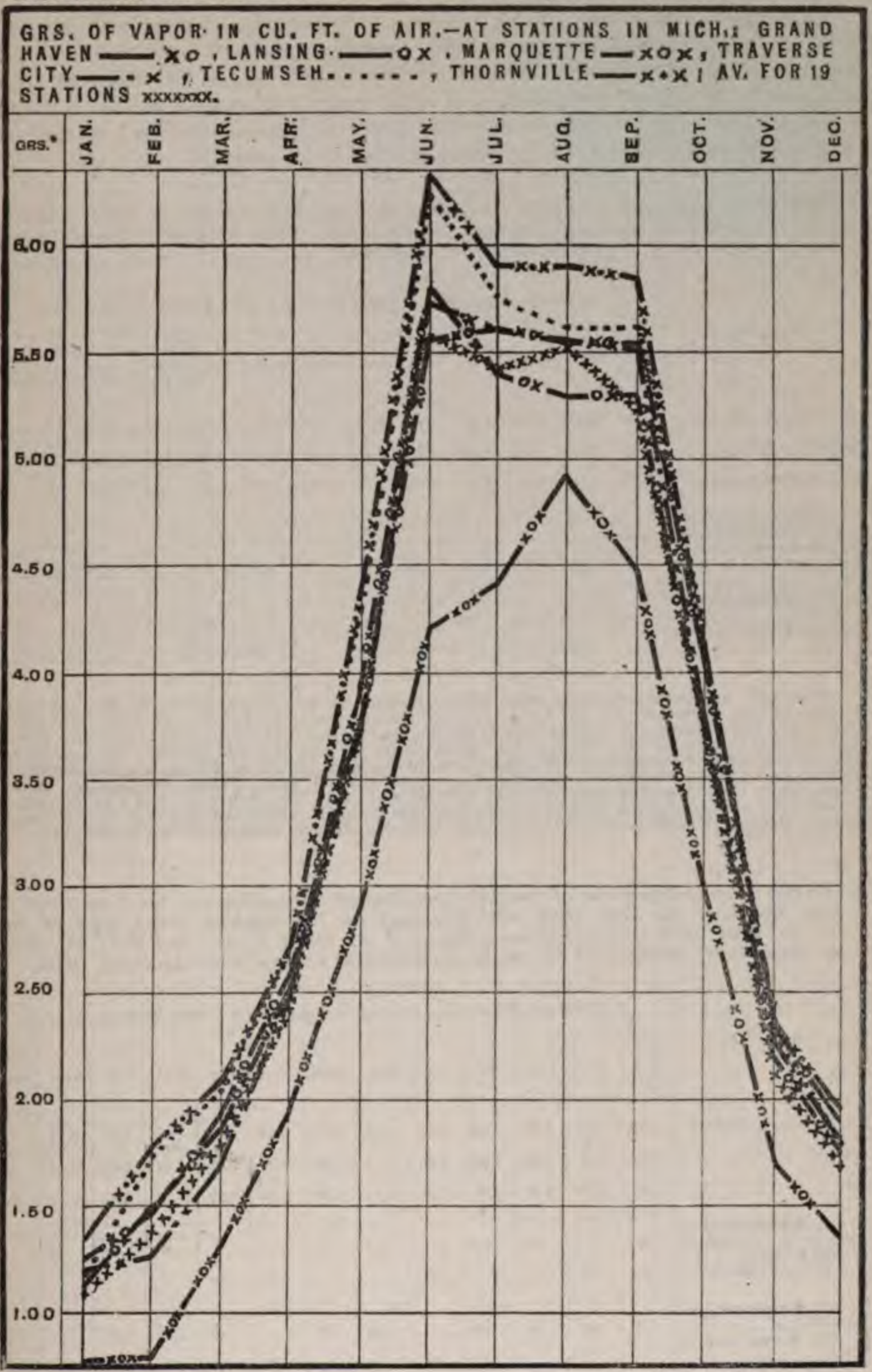
‡ The full names of the divisions and the counties in each division are stated in Exhibit 1, in a paper which follows, on weekly reports of sickness.

§ Numbers in this column state the average annual Absolute Humidity for periods of years ending in each case with Dec. 31, 1884. The small figures above and at the right of numbers which state the Absolute Humidity, denote the number of years included in the average.

‖ The computations for months in this line were made at Ann Arbor, from Guyot's tables and formula as given in the volume of Smithsonian Misc. Collections. The number of grains of vapor in a cubic foot of air at each observation, Ann Arbor excepted, was determined from readings of the psychrometer by means of Glaisher's table, Table XII. of the Smithsonian Meteorological and Physical Tables (1859).

The lines for 6 stations in Table IV. are graphically represented in Diagram III., page 37.

DIAGRAM III.—ABSOLUTE HUMIDITY, BY MOS., IN 1884.



*Scale, One Grain of Vapor (in a Cu. Ft. of Air) to 1.15 In. Vertically.

H. B. T., Del. Des. by H. B. B.

Exhibit 12 states the annual and monthly average at the State Agricultural College for eighteen years, and gives comparisons of 1884 with this average, and with the year 1883. Exhibit 11 states the average of all stations in Michigan, for a period of eight years, and compares 1884 with this average, and with the year 1883. The absolute humidity at each of nineteen stations by months in 1884, is stated in Table IV, page 36.

EXHIBIT 11.—*Average Absolute Humidity, by Year and Months, in 1884, compared with Annual and Monthly Averages for the Eight Years 1877-84. These Averages are for Groups of several Stations in Michigan.**

Years, Etc.	Absolute Humidity—Grains of Vapor in a Cubic Foot of Air.												
	Annual Av.	Jan.	Feb.	Mar.	April.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
Av. 8 years, 1877-84*	3.49	1.41	1.59	1.87	2.73	3.96	5.35	6.13	5.92	5.03	3.79	2.31	1.78
1883 (18 Stations*)	3.17	1.11	1.29	1.39	2.55	3.44	5.45	6.02	5.20	4.31	3.22	2.43	1.66
1884 (19 Stations*)	3.31	1.09	1.37	1.77	2.42	3.78	5.59	5.40	5.52	5.24	3.72	2.11	1.69
In 1884 **Greater** than Av. 8 years, 1877-84	......	......	......	......	......	......	.24	......	......	.21	......	......	......
In 1884 **Less** than Av. 8 years, 1877-84	.18	.32	.22	.10	.31	.18	......	.73	.40	......	.07	.20	.09
In 1884 **Greater** than in 1883	.14	......	.08	.38	......	.34	.14	......	.32	.93	.50	......	.03
In 1884 **Less** than in 1883	......	.02	......	......	.13	......	......	.62	......	......	......	.32	......

* Thornville and Detroit for the 8 years, 1877-84; Kalamazoo for the 7 years, 1877-83; Mendon for the 6 years, 1877-82; Tecumseh for the 7 years, 1878-84: Battle Creek for 1877-79, and 1882; Otisville for 1878-80, and 1882; Marquette, Alpena, Grand Haven, Port Huron, and Lansing for the 6 years, 1879-84; Agricultural College for 1877, 1878, and for 1881-84; Niles for 1878, 1879, and for 1881; Nirvana for 1878, 1879, and for the first 4 months of 1880; Reed City for the last 8 months of 1880, and for 1881-84; Benton Harbor and Coldwater for 1877 and 1878; Escanaba for the 5 years, 1880-84; Washington for the 4 years, 1880-83; Petoskey for 1879; Winfield for 1881 and 1883; Ann Arbor for the 4 years, 1881-84; Woodmere Cemetery for the 3 years, 1877-79; Traverse City, Hillsdale, and Marshall for the 3 years, 1882-84; Harrisville, Hastings, and Parkville for 1882; Manistique, Mackinaw City, Ionia, and Swartz Creek for 1884.

EXHIBIT 12.—*Comparison of the Average Absolute Humidity for the Year, and for each Month of the Year 1884, with averages for the eighteen Years 1866–83, and for the Year 1883.—Observations made at 7 A. M., 2 P. M., and 9 P. M., daily, by Prof. R. C. Kedzie, at the State Agricultural College, near Lansing, Mich.*

Years, Etc.	Absolute Humidity—Grains of Vapor in a Cubic Foot of Air.												
	Annual Av.	Jan.	Feb.	Mar.	April.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
Av. 18 years—1866-83	3.49	1.45	1.55	1.86	2.65	4.02	5.62	6.54	6.06	4.83	3.35	2.17	1.64
1883	3.34	1.26	1.53	1.62	2.66	3.67	5.88	6.37	5.27	4.34	3.22	2.51	1.77
1884	3.57	1.28	1.67	2.01	2.58	4.17	6.09	5.94	5.67	5.52	3.87	2.19	1.84
In 1884 **Greater** than Av. for 18 yrs. 1866-83	.08	......	.12	.15	......	.15	.47	......	......	.69	.52	.02	.20
In 1884 **Less** than Av. for 18 yrs., 1866-83	......	.17	......	......	.07	......	......	.60	.39	......	......	......	......
In 1884 **Greater** than in 1883	.23	.02	.14	.39	......	.50	.21	......	.40	1.18	.65	......	.07
In 1884 **Less** than in 1883	......	......	......	......	.08	......	......	.43	......	......	......	.32	......

EXHIBIT 13.—*Average Relative Humidity, by Year and Months, in 1884, compared with Annual and Monthly Averages for 1883, and for the Seven Years, 1878-1884. These Averages are for Groups of Several Stations in Michigan.**

Years, Etc.	Per Cent of Saturation,—Relative Humidity.												
	Annual Av.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
Av. 7 years, 1878-84*...	75	81	79	76	68	67	72	72	73	75	62	78	82
1883 (18 stations*)........	75	82	81	75	67	70	77	76	71	75	76	76	80
1884 (19 stations*)........	75	80	82	77	67	70	73	71	73	73	75	79	83
In 1884 **Greater** than av. for 7 years, 1878-84....................	0	......	3	1	......	3	1	......	0	......	13	1	1
In 1884 **Less** than av. for 7 years, 1878-84...	0	1	......	......	1	......	......	1	0	2	......	......	......
In 1884 **Greater** than in 1883.................	0	......	1	2	0	0	......	......	2	......	......	3	3
In 1884 **Less** than in 1883	0	2	......	......	0	0	4	5	......	2	1	......	......

*Thornville, Tecumseh and Detroit for the 7 years, 1878-84; Kalamazoo for the 6 years, 1878-83; Mendon for the 5 years, 1878-82; Otisville for 1878-80 and for 1882; Nirvana for 1878-79; Nirvana and Reed City for 1880; Ann Arbor for the 4 years, 1881-84; Agricultural College for 1878 and for the 4 years, 1881-84; Niles for 1878-79 and 1881; Marquette, Alpena, Grand Haven, Port Huron and Lansing for the 6 years, 1879-84; Woodmere Cemetery for 1878-79; Escanaba for the 5 years, 1880-84; Washington for the 4 years, 1880-83; Coldwater for 1878; Petoskey for 1879; Mallory Lake and Hudson for 1881; Marshall, Hillsdale and Traverse City for the 3 years, 1882-84; Hastings and Harrisville for 1882; Winfield for 1883; Reed City for the 4 years, 1881-84; Battle Creek for 1878, 1879 and also for 1882; Manistique, Mackinaw City, Ionia and Swartz Creek for 1884.

EXHIBIT 14.—*Comparison of the Average Relative Humidity of the Air (Per Cent of Saturation) for the Year and for each Month of the Year 1884, with Averages for the 20 Years, 1864-83, and for 1883.—Observations made at 7. A. M., 2 P. M., and 9 P. M. Daily, by Prof. R. C. Kedzie, at the State Agricultural College, near Lansing, Michigan.*

Years, Etc.	Per Cent of Saturation,—Relative Humidity.												
	Annual Av.	Jan.	Feb.	Mar.	April.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
Av. 20 years, 1864-83....	79	86	85	84	71	69	76	74	77	80	80	82	86
1883......................	81	95	94	85	69	72	81	80	74	78	78	80	86
1884......................	81	93	92	86	68	73	76	76	75	76	80	83	90
In 1884 **Greater** than Av. 20 years, 1864-83.	2	7	7	2	......	4	0	2	......	......	0	1	4
In 1884 **Less** than Av. 20 years, 1864-83......	......	......	......	......	3	......	0	......	2	4	0	......	...
In 1884 **Greater** than in 1883.................	0	......	......	1	......	1	......	......	1	......	2	3	4
In 1884 **Less** than in 1883..................	0	2	2	......	1	......	5	4	......	2	......	......	...

TABLE V.—RELATIVE HUMIDITY.—*Average Per Cent. of Saturation of the Atmosphere with Vapor of Water during the Year, and during each Month of the Year 1884, at 19 Stations in Michigan.—Average of Observations made Daily at 7 A.M., 2 P.M., and 9 P.M.,* by Observers† for the State Board of Health, and for the U. S. Signal Service.*

Stations in Michigan.† (Those of the U. S. Signal Service in Italics.)	Divisions of the State.†	Per Cent. of Saturation—Relative Humidity.													
		Year.		Months, 1884.											
		Norm. ‡	1884.	Jan.	Feb.	Mar.	Apr.	May.	Jun.	July.	Aug.	Sep.	Oct.	Nov.	Dec.
Av. for 19 Stations......	....	......	75	80	82	77	67	70	73	71	73	73	75	79	83
Marquette..............	U. P.	69^{6}	69	63	70	67	68	68	67	70	73	70	67	71	77
Manistique..............	U. P.	......	81	88	90	80	70	76	76	80	82	79	[i] 78	85	90
Escanaba..............	U. P.	74^{5}	73	74	[f] 73	[b] 72	70	68	72	70	76	77	74	75	75
Traverse City............	N. W.	84^{3}	83	88	88	81	80	80	78	78	[a] 78	79	81	86	93
Mackinaw City..........	N.	......	76	78	78	75	70	73	77	74	76	76	73	78	81
Alpena..............	N. E.	75^{6}	75	74	74	73	68	71	74	73	75	74	[a] 75	84	[b] 83
Grand Haven..........	W.	75^{6}	74	78	81	76	64	68	69	74	76	75	73	76	81
Reed City..............	W.	68^{7}	65	64	70	65	58	63	65	64	66	70	[c] 71	64	[e] 62
Port Huron..............	B. & E.	76^{6}	77	80	82	80	75	73	73	75	61	75	77	83	87
Thornville..............	B. & E.	79^{7}	80	92	93	85	71	72	73	71	74	74	78	82	90
Agricultural College...	C.	79^{21}	81	93	[g] 92	86	38	73	76	76	75	76	[a] 80	83	90
Ionia..................	C.	......	78	86	92	82	65	71	75	73	74	76	78	79	88
Lansing..............	C.	70^{6}	71	82	83	72	61	64	68	63	66	66	70	76	82
Swartz Creek............	C.	......	75	82	84	77	66	69	72	70	71	71	76	[d] 80	[h] 84
Ann Arbor..............	S. C.	78^{4}	79	[m] 79	[k] 83	[h] 81	[l] 68	[e] 71	[e] 80	77	81	81	78	81	88
Hillsdale..............	S. C.	72^{3}	71	[e] 72	80	70	61	70	74	67	66	66	72	76	79
Marshall..............	S. C.	76^{3}	75	79	85	79	65	70	74	68	71	70	78	79	[h] 83
Tecumseh..............	S. C.	78^{7}	79	89	91	[d] 84	69	75	[c] 77	[b] 68	[j] 71	73	[e] 79	[c] 83	88
Detroit..............	S. E.	71^{7}	69	73	77	72	62	61	68	65	67	68	66	71	73

[a], [b], [c]. In the columns from January to December, inclusive, the letters [a], [b], [c], etc., stand directly above the numbers from which they refer to the notes below.

[a] For 92 observations. [b] For 91 observations. [c] For 89 observations. [d] For 88 observations.
[e] For 87 observations. [f] For 86 observations. [g] For 85 observations. [h] For 83 observations.
[i] For 82 observations. [j] For 81 observations. [k] For 79 observations. [l] For 72 observations.
[m] For 64 observations.

*At the stations of the U. S. Signal Service for the year 1884, the observations were made at 7 A.M., 3 P.M., and 11 P.M., Washington mean time. The corresponding local time for each of these stations is stated in the star (*) foot-note to Table I., page 28.

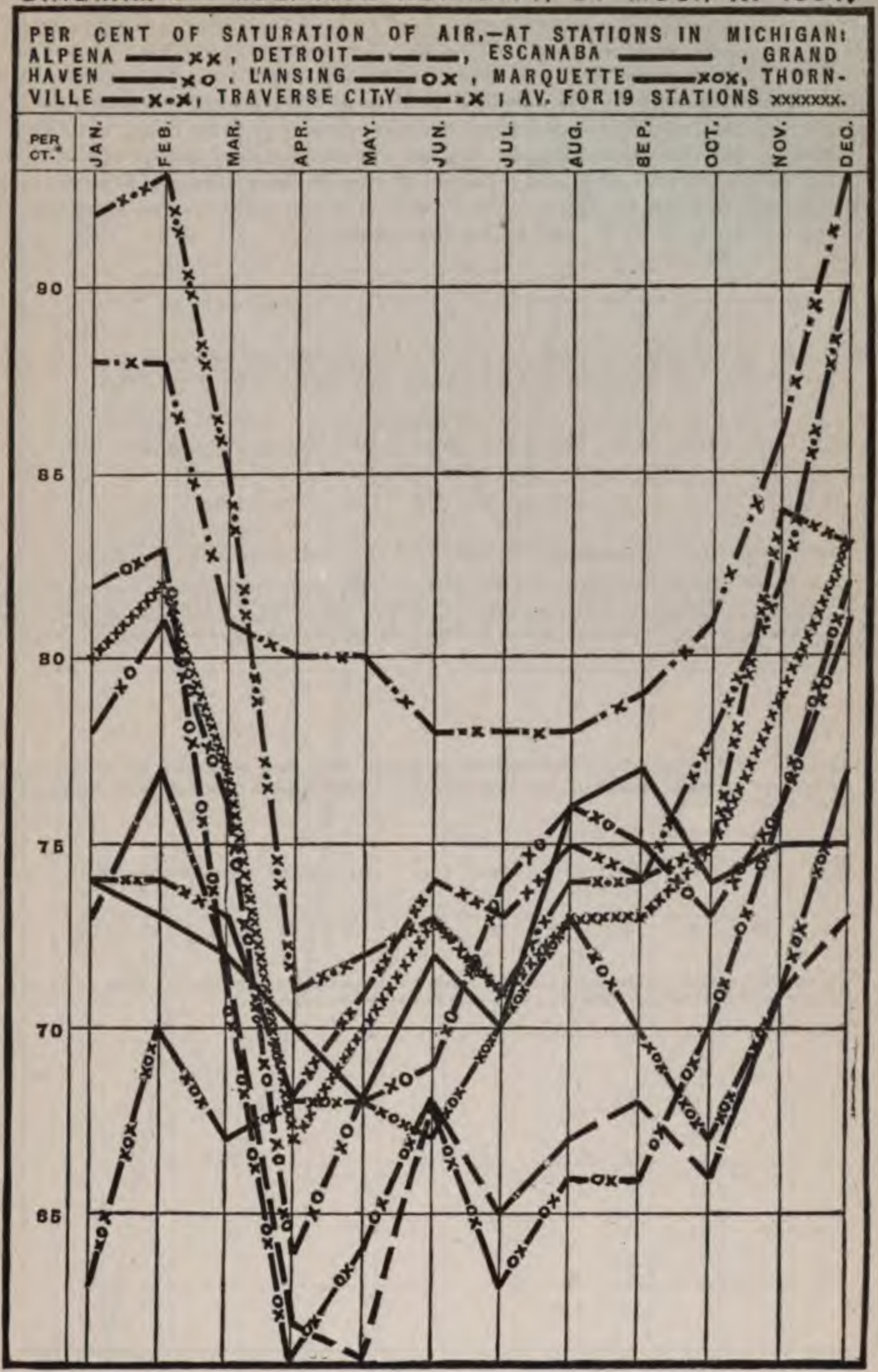
† The names of observers, their places of observation, and the counties in which these places are situated, are stated in Exhibit 1, page 6. The full names of the divisions and the counties in each division are stated in Exhibit 1, in a paper which follows, on weekly reports of diseases.

‡Numbers in this column state the average annual Relative Humidity for periods of years ending in each case with Dec. 31, 1884. The small figures above and at the right of the numbers which state the Relative Humidity, denote the number of years including the average.

NOTE.—The tri-daily observations with the psychrometer at Marquette, Escanaba, Mackinaw City, Grand Haven, Port Huron, and Detroit for 1884, were reduced (by tables in "Signal Service Order No. 41, 1881, and in Instructions to Voluntary Observers," 1882,) and the monthly means for those months were computed, by the observers at those stations, February excepted, at Detroit. In all other cases the observations were reduced by Guyot's table, in Smithsonian Meteorological Tables, or by a table substantially the same as that. Computations for Ionia for each month in 1884, except June, and for Ann Arbor for each month in 1884, except Jan. and April, were made by the observers there. All other computations in Table V., were made at the office of the State Board of Health.

Graphic representations of 8 representative lines in Table V are given in Diagram IV., page 41.

DIAGRAM IV.—RELATIVE HUMIDITY, BY MOS., IN 1884,



*SCALE. TEN PER CENT OF SATURATION TO 1.99 IN. VERTICALLY.
H. B. T., DEL. DES. BY H. B. B.

FOGS.

For the year 1884, fog was reported at 291 morning observations, at 82 afternoon observations (at about 2 P.M.), at 93 evening observations (at about 9 P.M.), and 50 times during the day, no special time being mentioned, in many cases the same fog, or fog at the same time, being reported by different observers. Fog was reported at one or more stations at some time during the day, on 177 days, as follows: On 135 days in the morning, on 43 days at about 2 P.M., and on 54 days at night.

EXHIBIT 15.—*Number of Different Days on which Fog was Observed at one or more of 23 Stations* in Michigan in 1884, and in each Month of the Year 1884.*

Year, 1884.	Jan.	Feb.	March.	April.	May.	June.	July.	August.	Sept.	October.	Nov.	Dec.
177	3	9	6	9	18	18	16	22	19	21	15	21

NOTE.—Graphic representations of Statements in Exhibit 15 are given in Diagram No. V., page 43.

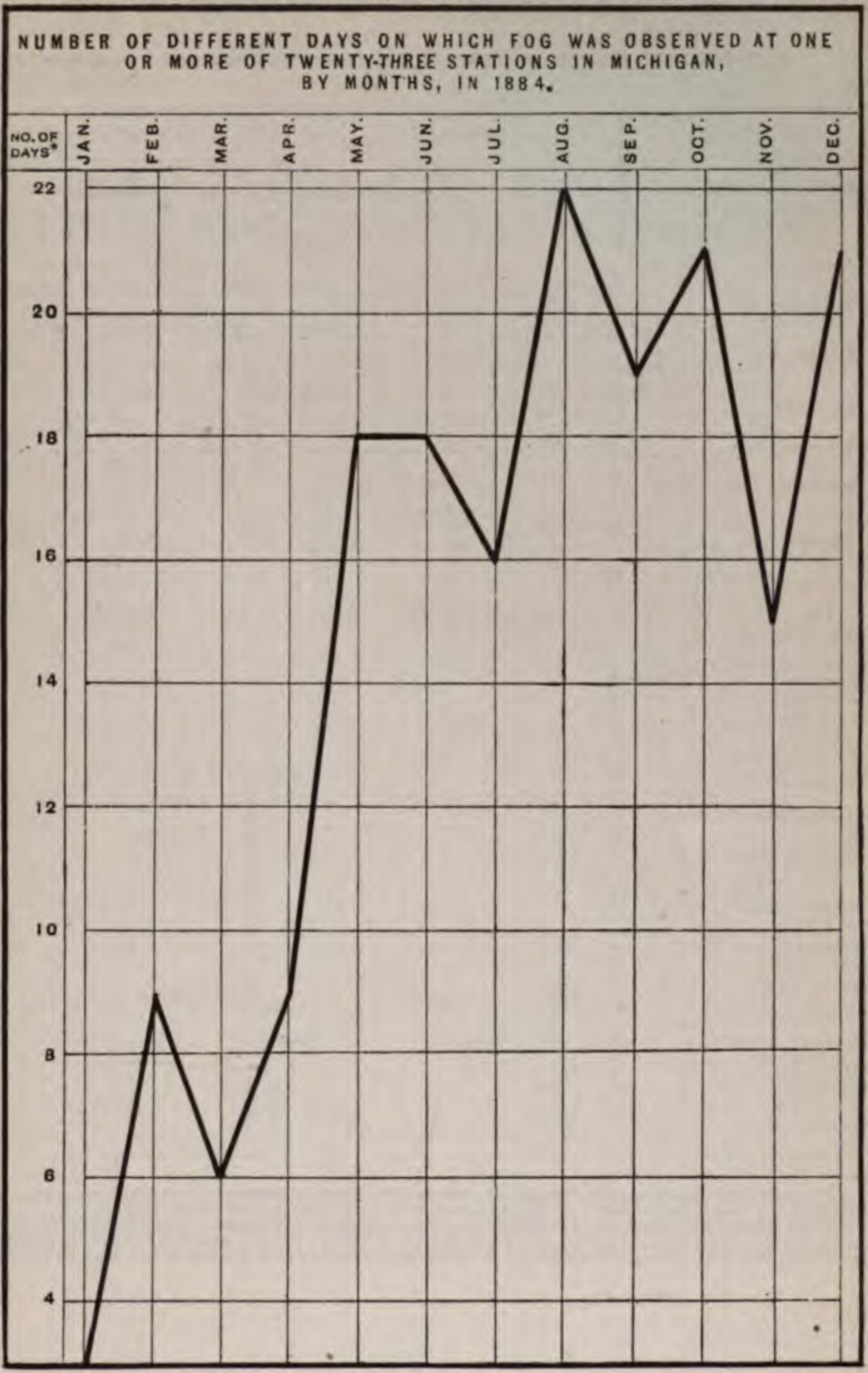
*This exhibit contains statements only for those localities from which reports were received for every month of the year, as follows: Marquette, Manistique, Escanaba, Traverse City, Mackinaw City, Alpena, Grand Haven, Reed City, Port Austin, Port Huron, Thornville, Agricultural College, Ionia, Lansing, Swartz Creek, Ann Arbor, Battle Creek, Hillsdale, Kalamazoo, Marshall, Parkville, Tecumseh, and Detroit.

EXHIBIT 16.—*Number of Observations at which Fog was Observed in Michigan in 1884, and in each Month of the Year 1884. Observations taken 3 times Daily at 23 Stations.**

Year, 1884.	Jan.	Feb.	March.	April.	May.	June.	July.	August.	Sept.	October.	Nov.	Dec.
516	10	59	11	10	39	45	42	61	47	55	30	107

*This exhibit contains statements only for those localities from which registers were received for every month of the year, as stated in a foot-note to Exhibit 15, page 42.

DIAGRAM V.—CONCERNING FOGS IN MICHIGAN, IN 1884.



NUMBER OF DIFFERENT DAYS ON WHICH FOG WAS OBSERVED AT ONE OR MORE OF TWENTY-THREE STATIONS IN MICHIGAN, BY MONTHS, IN 1884.

*SCALE, ONE DAY TO .33 IN, VERTICALLY.

H. B. T. DEL. DES. BY H. S. B.

EXHIBIT 17—*Number of Different Days on which Fog was recorded in 1884, at 29 Stations*

Stations in Michigan.*	No. of days in 1884.	January.			February.			Line Number.
		Day of Month.	Hour of Observation.		Day of Month.	Hour of Observation.		
			A. M.	P. M.		A. M.	P. M.	
Marquette	17	0			18		2:19	1
								2
								3
Manistique	26	30		2	18	7	2	4
								5
Escanaba	95	23		2:20	18, 19	6:20		6
		25, 30			18		9:20	7
								8
Traverse City	6	0			0			9
Mackinaw City	24	0			0			10
								11
Alpena	18	30	9:10 till	4	18		Night till	12
					19	6:23 to	3:40	13
								14
Harrisville	10							15
								16
Grand Haven	29	30	Early morn till	1:45	5, 18	6:23		17
								18
								19
Grand Rapids	1	0			0			20
Reed City	13	0			0			21
Lexington	1							22
Port Austin	8	0			0			23
								24
Port Huron	23	0			0			25
								26
Thornville	10	0			8, 12, 18	A. M.	P. M.	27
					17		Night.	28
Agricultural College	8	30		2	5, 18, 25	7		29
					18		2 and 9	30
Ionia	37	0			18	6 to	5	31
Lansing, Office of S. B. of H.	8	0			5, 18	7		32
					18		2 and 9	33
Swartz Creek		0			12		8	34
	11				17		Night till	35
					18		Night.	36
					19		7 to 9	37
Winfield	6	0			18	7		38
Ann Arbor	6	0			0			39
Battle Creek	6	0			18			40
					27	Morning.		41
Hillsdale	22	30	till 9		4,5,12,18	A. M.	P. M.	42
								43
Hudson	10	30	Forenoon.		5,8,12,18,19			44
Kalamazoo	5	0			0			45
Marshall	3	0			0			46
Parkville	26	30			8, 18			47
Tecumseh	11	0			18, 19	7		48
Detroit	19	30		2:36	18, 25	6:30		49
					18		2:36	50
Washington, Mich.		30	7	2				51

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* The names of observers, their places of observation, and the counties in which these places are situated, are stated in Exhibit 1, in a paper which follows, on weekly reports of sickness.

NOTE.—Monthly registers were received from Moorestown for December; from Harrisville, April to December; from Grand Rapids, January to March and May; from Lexington, January to September; from Winfield, January to October; from Hudson, January and February and May to Decem-

and in each Month the Dates and Hours of Observation when Fogs were recorded in Michigan.

Line Number.	March.			April.			May.			June.		
	Day of Mo.	Hour of Observation.		Day of Month.	Hour of Observation.		Day of Month.	Hour of Observation.		Day of Month.	Hour of Observation.	
		A. M.	P. M.		A. M.	P. M.		A. M.	P. M.		A. M.	P. M.
1	0			15	7:19		18, 24		9:19	1		2:19
2							22		2:19 & 9:19	8	7:19	2:19
3							23	7:19				
4	22	8 till 10		0			5	7	2 and 9	5, 6, 16		9
5	23	4 till 8					22		9	7,18,22, 23,24	7	
6	25	6:20		11	6:20		5, 19	6:20		8,18,19, 22,23,24	6:20	
7				16		2:20	16, 22		2:20			
8				14,15,19,27			4,13,23,24					
9	0			0			30		2	3	7	
10	22	7		0			5,6,17,31	7		3,7,8,15, 17,19, 24,29	7	
11							6		3	18		11
12	0			26	6:34		5		8:10 to	19	5:30 to	4
13							6	11:10		20		Night till
14										21	8	
15				0			5		Toward night.	3	Morn.	
16							6,7,8,26			19		
17	23	6:23		0			1,19	6:23	2:23			
18							5	6:23				
19							4		10:23	19	6:23	
20	24	7					0					
21	24	7		0			0			20,21,22	7	
22												
23	0			0			1, 26		2	3	7	
24							25	7				
25	0			0			8	6:38		19		10:38
26							26		10:38	20	6:38	
27	0			18	8 till 9		0			0		
28												
29	0			0			26	7		12	7	
30												
31	0			0			0			0		
32	0			0			26	till 8		0		
33												
34	0			0			0			12	2 till 8	
35										22	till 9	
36												
37												
38	0			0			0			0		
39	0			0			0			0		
40												
41	0			0			0			0		
42	20,24	7		8	7		6	7		0		
43	20		9									
44							0			7	Foren'n.	
45	0			0			0			7		Night.
46	24	7		0			0			0		
47	0			0			20			7, 21		
48	10	7		0			0			21		9
49	0			0			0			0		
50												
51												

ber; from Washington, for December. Registers were received, but with no fog recorded thereon, from Mendon for 9 months, January to September; from Boyne City, for November and December. A cipher (0) indicates that a monthly register was received from the station with no fog recorded thereon.

EXHIBIT 17.—CONTINUED.—*Dates when*

Stations in Michigan.*	July.			August.			September.			Line Number.
	Day of Month.	Hour of Observation.		Day of Month.	Hour of Observation.		Day of Month.	Hour of Observation.		
		A. M.	P. M.		A. M.	P. M.		A. M.	P. M.	
Marquette	4,24,25,27	6:19		11	6:19		0			1
	4		2:19&10:19	17,19		10:19				2
Manistique	11	7		11 12 16	6 till 8 5 till 10 7		8		2	3
	24 26		6 to 8 3 to 8							4
Escanaba	9,25,30	6:20		4, 6, 12, 13, 16, 20, 27	6:20		6,10,15, 19,24,28	6:20		5
	2, 4, 10, 11,23,24, 27,29			12 3, 18, 29		2:20&10:20	15 23 17,30		2:20 10:20	6
Moorestown										7
										8
										9
										10
										11
Traverse City	28	7		0			0			12
										13
Mackinaw City	22, 27	7		12,13,18	7		0			14
				12		3				15
Alpena	0			12		Night, till				16
				13	11:30					17
				29	12:15	Till night.	5 8		10 6:10	18
Harrisville										19
Grand Haven	4, 10, 25	6:23		10,14,15,27,29	6:23		8,20,25	6:23		20
	25		2:23	24		2:23				21
										22
Reed City	24	7		27	7		25, 29	7		23
										24
Lexington	0			0			26	7		25
Port Austin	27			15	7		9	7		26
							9		9	27
Port Huron	25	6:38		15	6:38		5, 19	6:38		28
	15, 24		10:38	10, 29		10:38	4,8,13,18,30		10:38	29
Thornville	25	7		0			0			30
Agr'l College	24		9	0			29	7		31
Ionia	27, 28, 29	6 to 8		8,9,12,13, 14,15,16,17 18,22,24 27	6 to 8		1,5,8,25	6 to 9		32
				29	6 to 10		29	6 to 8		33
				31	6 to 9					34
										35
										36
Lansing	0			29	7		8, 29	7		37
Swartz Creek	25	4 till 8:30		27	4 to 7		5	7		38
Winfield	27	7		0			8,23,29,30	7		39
Ann Arbor	0			0			5, 23	7		40
										41
Battle Creek	0			0			0			42
										43
										44
										45
Hillsdale	0			7	7		25,29,30	7		46
										47
										48
Hudson	0			0			23,29	A. M.		49
										50
Kalamazoo	29	2:15till7:15		0			0			51
										52
										53
Marshall	0			0			29	7		54
Parkville	18, 29			8,13,14,15, 27,29,31	Morn.		1,25,29	Morn.		55
										56
Tecumseh	0			0			23	7		57
										58
Detroit	25	6:36		28		2:36	8	6:36		59
										60
										61

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* *The names of observers, their places of observation, and the counties in which these places are situated are stated in Exhibit 1, in a paper which follows, on weekly reports of sickness.*

Fogs were Recorded in 1884.

Line Number.	October.			November.			December.		
	Day of Month.	Hour of Observation.		Day of Month.	Hour of Observation.		Day of Month.	Hour of Observation.	
		A. M.	P. M.		A. M.	P. M.		A. M.	P. M.
1	0			22		2:19	6	6:19	
2									
3	3,12	7		12 16	3 till 9 7		0		
4	10		2 till 4						
5	2,3,12,16,24	6:20		4,15,16, 17,23,24	6:20		6,8,14,20,22	6:20	
6	29 2 20,21,22,27		2:20 10:20	16 22 5,6,29		2:20 10:20	6,7,14,20, 5,6,7,20,21 24 to 31 1,10,17		2:20 10:20
7							5		4 till
8							6	10	
9							28	9 till	6
10							29		8
11							30	Forenoon.*	2 till 11
12	0			0			28		2
13							5,29		9
14	3	7		0			30	7	
15							5 28		3 and 11 3
16	0			0			5 28 29	12:30 till 11:15 10:30 to	5 5:30 till
17							30		8
18									
19							28,29,30		
20	5,12	6:23		0			5	6:23	
21	28		10:23				5,28,29,30		2:23
22							6		10:23
23	3	7		3,16	7		27	Morn. till–	
24							31		P. M.
25									
26	0			0			5		2
27									
28	3	6:38		16	6:38		0		
29	2,12,20		10:38	13		10:38			
30	2		P. M.	12	Morn.		5,28	7	2 & 9 P.M.
31	0			0			0		
32	9,10,11,15,17	6 till 8		10,13,15	6 till 10		4		6 till
33				15		11 till	5	7 till	2
34				16	10		28		12:30 till 6
35							29		2 till 7
36							30	7 till	12
37	13	Morn.		0			5	7	
38	30		Night.	0			5	7	
39	0								
40	2		9	22	7		2,30	7	
41	3,30	7							
42	0			0			26	5 till 8	
43							28	8 till 12	
44							29		9 till
45							30	10	
46	1,2,5,13	7		12	7		5,30	7	
47							5,28		2
48							29		9
49	2		Eve.						
50	3	Morn.		0			5,28,29,30		
51	2	5 till 8		0			0		
52	5	1:10 till 8:30							
53	16		Night.						
54	17	7		0			0		
55	2,13,17	Morn.		8	Morn.		5,29,30		
56	16		Eve.						
57	2		9	0			5,28	7	
58	3,30	7					29	A. M.	P. M.
59	2		10:36	4		2:36	2,5,6	6:36	
60	3,7,15,29,30	6:36		13		10:36	6		2:36
61				14	6:36				

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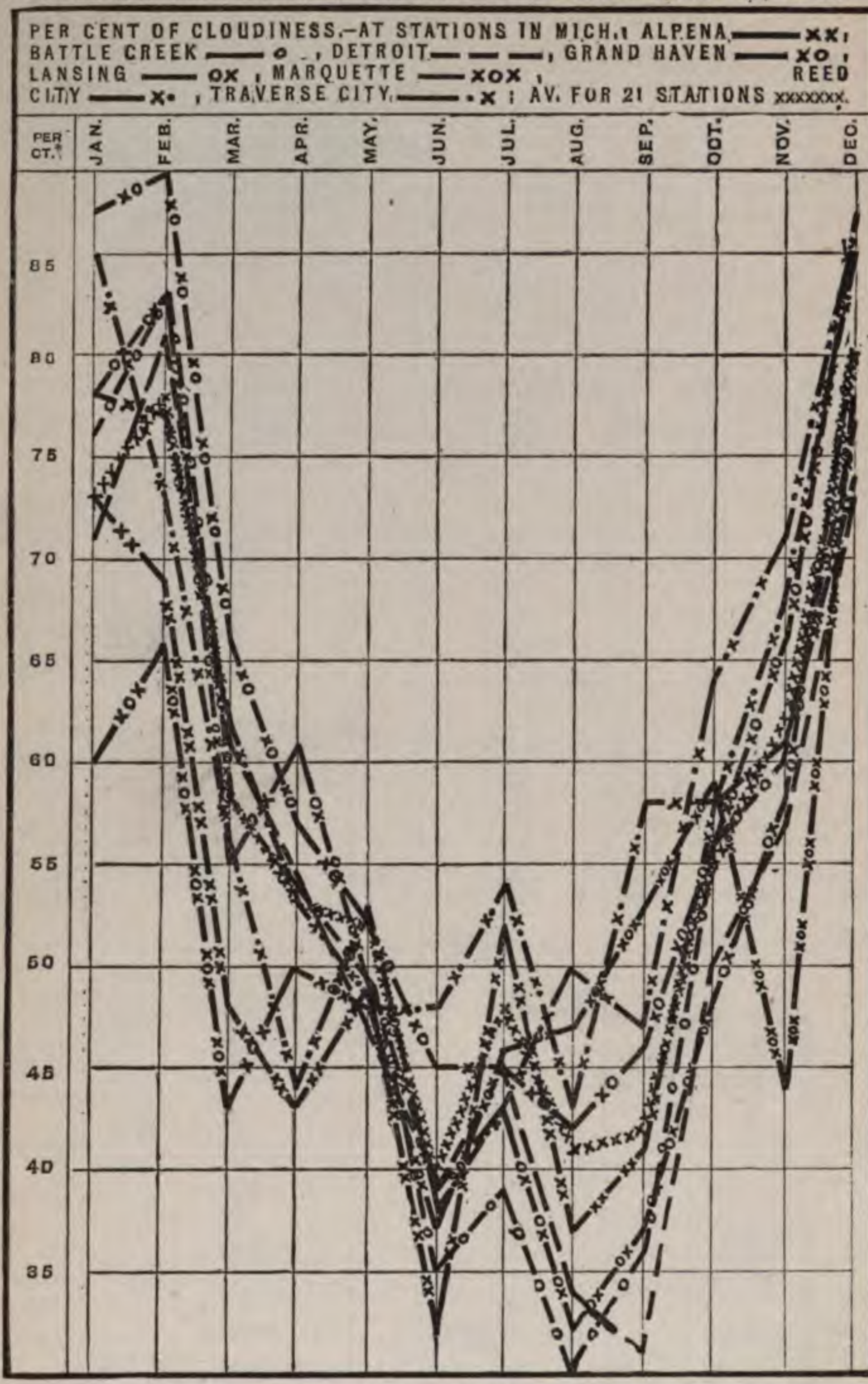
* Lifted at 12 noon.

DIAGRAM VI.—AV. PER CT. OF CLOUDINESS, MOS., 1884.



*SCALE, TEN PER CENT TO 1.08 IN. VERTICALLY.

H. B. T. DEL. DES. BY H. B. B.

TABLE VI.—*Average Per Cent of Cloudiness for the Year, and for each Month of the Year 1884, at each of 22 Stations in Michigan, and also the Average for 21 of the same Stations. Average of Observations made Daily at 7 A. M., 2 P. M., and 9 P. M.,* by Observers for the State Board of Health,† and for the U. S. Signal Service.*

Stations in Michigan.† (Those of the U. S. Signal Service in Italics.)	Division of the State.‡	Average Per Cent of Cloudiness.													
		Year.		Months, 1884.											
		Norm. ‖	1884.	Jan.	Feb.	Mar.	Apr.	May.	J'ne.	J'ly.	Aug.	Sep.	Oct.	Nov.	Dec.
Av. for 21 stations.§	....	......	57	73	78	58	53	52	40	48	41	42	55	62	80
Marquette	U. P.	59^{6}	53	60	66	43	50	48	37	46	47	53	59	44	78
Manistique	U. P.	......	49	55	59	39	47	^{e}49	^{h}31	^{a}47	^{b}43	42	^{k}46	59	73
Escanaba	U. P.	58^{5}	57	53	68	53	50	59	45	53	59	57	59	59	71
Traverse City	N. W.	60^{3}	59	85	73	56	^{d}44	^{f}53	^{d}38	^{d}43	50	47	64	71	^{c}85
Mackinaw City	N.	......	60	72	69	52	48	54	37	52	47	52	64	80	88
Alpena	N. E.	57^{6}	53	73	69	48	43	49	32	52	37	41	58	61	74
Grand Haven	W.	58^{6}	62	87	89	66	57	52	45	45	42	46	56	66	87
Reed City	W.	61^{7}	61	78	77	^{a}62	53	48	^{f}48	^{a}54	^{a}43	^{e}58	^{d}58	^{f}68	^{d}85
Port Austin	B. & E.	39^{2}	39	^{p}52	^{p}61	^{k}30	^{g}36	^{i}30	^{m}11	^{o}25	^{l}17	^{j}32	^{n}44	^{g}58	^{q}71
Port Huron	B. & E.	58^{6}	54	74	76	54	48	52	34	42	37	38	57	60	71
Thornville	B. & E.	53^{8}	52	68	80	60	47	48	33	^{a}40	30	29	50	64	74
Agr'l College	C.	58^{21}	58	77	85	61	57	50	41	46	36	36	53	61	87
Ionia	C.	62^{2}	61	77	83	61	58	59	47	55	40	43	54	63	86
Lansing	C.	55^{6}	55	78	83	55	61	49	39	43	32	37	48	58	80
Swartz Creek	C.	......	53	^{c}71	^{g}79	^{c}59	^{f}49	^{f}49	^{f}32	^{b}41	^{e}33	^{c}31	^{a}53	59	^{a}76
Ann Arbor	S. C.	59^{5}	61	73	^{g}82	^{a}59	^{d}57	53	51	56	49	40	58	67	81
Battle Creek	S. C.	57^{3}	54	76	83	58	54	^{a}49	35	39	30	36	56	60	77
Hillsdale	S. C.	63^{3}	62	^{f}70	85	70	^{d}65	^{a}60	46	57	47	^{d}44	52	61	81
Kalamazoo	S. C.	68^{8}	70	84	91	76	65	67	59	58	50	56	61	70	91
Marshall	S. C.	57^{4}	56	72	85	^{a}63	58	53	41	46	34	^{d}36	^{a}51	62	75
Tecumseh	S. C.	49^{8}	53	72	^{g}79	^{d}61	54	45	^{e}38	41	^{f}36	^{d}29	^{f}45	55	^{a}77
Detroit	S. E.	57^{6}	54	71	81	61	54	47	39	45	34	31	50	57	73

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[a], [b], [c] In the columns from January to December, inclusive, the letters [a], [b], [c], etc., stand directly above the numbers from which they refer to the notes below.

[a] For 92 observations. [b] For 91 observations. [c] For 90 observations. [d] For 89 observations.
[e] For 88 observations. [f] For 87 observations. [g] For 85 observations. [h] For 83 observations.
[i] For 77 observations. [j] For 75 observations. [k] For 71 observations. [l] For 70 observations.
[m] For 66 observations. [n] For 65 observations. [o] For 63 observations. [p] For 62 observations.
[q] For 60 observations.

* At stations of the U. S. Signal Service the observations were made at 7 A. M., 3 P. M., and 11 P. M., Washington mean time. The corresponding local time for each of these stations is stated in the star (*) footnote to Table I., page 28.

† The names of observers, their places of observation, and the counties in which these places are situated, are stated in Exhibit 1, page 6.

‡ The full names of divisions and the counties in each division are stated in Exhibit 1, in a paper which follows, on weekly reports of sickness.

‖ Numbers in this column state the average per cent of cloudiness for periods of years ending in each case with Dec. 31, 1884. The small figures above and at the right of numbers which state the per cent of cloudiness, denote the number of years included in the average. Computations of average per cent of cloudiness were made and furnished by the observers at Marquette, Mackinaw City, Alpena, Grand Haven, Ionia, June excepted, and Ann Arbor, January excepted, for each month in 1884. All other computations in Table VI., were made at the office of the State Board of Health.

§ This line is an average for only the stations from which statements, nearly complete, were received for every month of the year. It does not include the line for Port Austin.

Graphic representations of 8 representative lines in this table are given in Diagram No. VI., page 48.

EXHIBIT 18.—*Average Per Cent of Cloudiness, by Year and Months, in 1884, Compared with Annual and Monthly Average for 1883, and for the eight Years, 1877–1884. These Averages are for Groups of several Stations in Michigan.**

Years, Etc.	Per Cent of Cloudiness.												
	Annual Av.	Jan.	Feb.	Mar.	April.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
Average for 8 years,—1877-1884*	56	68	62	61	51	48	48	43	47	45	57	67	77
1883—(22 stations*)	57	69	63	52	53	62	58	51	32	48	68	61	69
1884—(21 stations*)	57	73	78	58	53	52	40	48	41	42	55	62	80
In 1884 **Greater** than Av. for 8 yrs—1877-84	1	5	16	......	2	4	......	5	......	......	......	......	3
In 1884 **Less** than Av. for 8 years—1877-84	......	......	......	3	......	......	8	......	6	3	2	5	......
In 1884 **Greater** than in 1883	0	4	15	6	0	......	......	......	9	......	......	1	11
In 1884 **Less** than in 1883	0	......	......	......	......	10	18	3	......	6	13	......	......

* Thornville, Kalamazoo and Tecumseh for the 8 years 1877-84; Mendon for the 7 years 1877-83; Battle Creek for the 4 years 1877-80 and for 1882-84; Nirvana for 1877-79 and for the first 4 months of 1880; Reed City for the last 8 months of 1880 and for the 4 years 1881-84; Detroit for 1877 and the 6 years 1879-84; Niles for the 4 years 1878-81; Benton Harbor for 1877, 1878 and 1880; Coldwater and Woodmere Cemetery for the 3 years 1877-79; Otisville for the 3 years 1878-80 and for 1882; Marquette, Alpena, Grand Haven, Port Huron and Lansing for the 6 years 1879-84; Washington for the 5 years 1879-83; Ypsilanti for 1877 and 1879; Agricultural College for 1877 and for the 4 years 1881-84; Petoskey for 1878 and 1879; Escanaba and Ann Arbor for the 5 years 1880-84; Fife Lake for 1877; Ionia for 1880, 1883 and 1884; Adrian for 1880; Hillsdale for 1880 and for the 3 years 1882-84; Marshall for the 4 years 1881-84; Parkville for 1881 and 1882; Winfield for 1881 and 1883; Hudson and Mallory Lake for 1881; Harrisville and Hastings for 1882; Traverse City for the 3 years 1882-84; Port Austin for 1883; Manistique, Mackinaw City and Swartz Creek for 1884.

EXHIBIT 19.—*Comparison of the Average Per Cent of Cloudiness in the Year and each Month of the Year 1884, with Averages for the Twenty Years, 1864–83, and for the Year 1883. Observations made at 7 A. M., 2 P. M., and 9 P. M., Daily, by Prof. R. C. Kedzie, at the State Agricultural College, near Lansing, Mich.*

Years, Etc.	Per Cent of Cloudiness.												
	Annual Av.	Jan.	Feb.	Mar.	April.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
Av. for 20 yr's, 1864-83	58	72	64	63	56	51	51	46	47	50	59	67	76
1883	58	67	61	48	54	66	62	54	34	53	70	58	65
1884	58	77	85	61	57	50	41	46	36	36	53	61	87
In 1884 **Greater** than Av. for 20 yr's, 1864-83	0	5	21	......	1	......	......	0	......	......	......	......	11
In 1884 **Less** than Av. for 20 yr's, 1864-83	0	......	......	2	......	1	10	0	11	14	6	6	......
In 1884 **Greater** than in 1883	0	10	24	13	3	......	......	......	2	......	......	3	22
In 1884 **Less** than in 1883	0	......	......	......	......	16	21	8	......	17	17	......	......

EXHIBIT 20.—*Dates of Auroras Observed and Recorded at Ten Stations in Michigan, during the Year 1884.*

Stations.	Dates of Auroras Recorded in 1884.											
	Jan.	Feb.	March.	April.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
Manistique	....	29	19,20,21,28	7, 24	......	....	....	......	13, 17, 18	13, 14	17	....
Escanaba	18, 25	29	1, 2, 6, 19 20, 21, 28	17, 24	......	18, 23, 24	13, 19	......	13, 17	9, 13, 14	......	19, 22, 23
Alpena	....	29	1, 20, 28	17, 19, 24	......	....	13, 19, 25	......	....	6, 9	......	19
Grand Haven	....	....	....	17, 24	......	....	....	......	13	....	......	....
Thornville	....	....	1	24	......	....	25	......	13	....	......	....
Lansing	....	....	1, 28	24	......	....	....	......	0	....	......	....
Ionia	....	....	....	....	......	....	....	......	17	....	......	....
Swartz Creek	....	22	1	17, 24	......	18, 22	13	......	13	....	......	....
Ann Arbor	....	....	....	....	......	....	....	......	13, 17	....	2	....
Hudson	....	....	....	....	......	....	....	......	17	....	......	....

METEORS.

Meteor fell in S. W., 8 P.M., Aug. 24.—*Kalamazoo.*

Meteor, 8:30 P.M., Aug. 19; course, S. W., altitude 30°.—*Ionia.*

Meteor, small,—motion slow,—direction, S. W., 8 P.M., Sept. 9.—*Thornville.*

Meteor, Oct. 17.—*Grand Haven.*

Meteor, Dec. 20.—*Thorn*

Meteor, small,—motion rapid,—course, N., Nov. 15.—*Thornville.*

Meteor, very bright,—moving from near the zenith toward the north, at 6:50 P.M., Dec. 4.—*Ann Arbor.*

In the following statement are named for each month in 1884, the days of the month clear ("all or nearly all sunshine"), and the days "all or nearly all cloudy," as observed by Dr. J. S. Caulkins, at Thornville. There is also stated for each month the number of clear and the number of cloudy days as thus determined.

JAN.—Clear, Jan. 4, 5, 6, 9, 15, 16, 19, 24, 25, 26, and 31,—11 days. Cloudy, 1, 2, 3, 8, 10, 11, 12, 13, 14, 17, 18, 22, 23, 28, 29, and 30,—16 days.

FEB.—Clear, 1, 7, 15, 16, 20, 21, and 29,—7 days. Cloudy, 2, 3, 4, 5, 6, 8, 9, 10, 11, 12, 13, 17, 18, 19, 22, 24, 25, 26, 27, and 28,—20 days.

MARCH.—Clear, 1, 4, 5, 12, 13, 14, 17, 24, 27, 29, and 30,—11 days. Cloudy, 2, 7, 8, 9, 19, 20, 25, 26, 28, and 31,—10 days.

APRIL.—Clear, 3, 4, 5, 6, 12, 13, 19, 21, 22, 23, 25, 26, 28, 29, and 30,—15 days.—Cloudy, 1. 2, 9, 10 11, 15, 16, 17, 20, and 24,—10 days.

MAY.—Clear, 3, 5, 11, 12, 15, 16, 17, 18, 20, 21, 23, 28, 29, 30, and 31,—15 days. Cloudy, 1, 4, 7, 13, 22, 24, 25, and 27,—8 days.

JUNE.—Clear, 1, 3, 4, 5, 6, 7, 8, 12, 13, 14, 15, 16, 17, 26, 27, 28, 29, and 30,—18 days. Cloudy, 9, 10, and 13,—3 days.

JULY.—Clear, 1, 2, 5, 7, 8, 10, 11, 13, 14, 16, 17, 18, 19, 20, 21, 22, 27, and 29,—18 days. Cloudy, 3, 9, 24, and 25,—4 days.

AUGUST.—Clear, 1, 2, 5, 7, 8, 9, 10, 12, 13, 14, 15, 16, 17, 18, 20, 21, 22, 23, 24, 26, 27, 29, and 31,—23 days. Cloudy, 3, 4, 25, and 28,—4 days.

SEPT.—Clear, 1, 2, 3, 4, 5, 6, 9, 10, 11, 12, 13, 14, 17, 18, 20, 21, 25 26, 29, and 30,—20 days. Cloudy, 19, 22, 23, and 28,—4 days.

OCT.—Clear, 1, 2, 5, 8, 10, 11, 13, 14, 15, 17, 18, 20, and 23,—13 days. Cloudy, 3, 6, 8, 16, 22, 24, 25, 26, 30, and 31,—10 days.

NOV.—Clear, 2, 8, 9, 10, 14, 15, 16, 19, and 30,—9 days. Cloudy, 4, 11, 17, 18, 20, 21, 22, 23, 24, 25, 27, 28, and 29,—14 days.

EXHIBIT 21.—*Dates of Solar and Lunar Halos,*

Line Number.	Stations.	Dates of Halos Recorded,									
		January.		February.		March.		April.		May.	
		Solar.	Lunar.	Solar.	Lunar.	Solar.	Lunar.	Solar.	Lunar.	Solar.	Lunar.
1	Manistique	....	11,12	....	......	4	4,5	....	......	....	...
		....	....	....	......	....	6,7	....	......	....	...
2	Escanaba	1,5,11,12	11,17	1,3,5	7,9,10	4,6,7	4,6,7	2,6,13	......	1,11,25	...
		19,25,31	....	6,10,11	......	8,20,25	......	17,22,26	......	26,29,31	...
		....	....	20,21,27	......	26,28,30	......	29	......	....	...
3	Traverse City	....	....	....	......	....	......	....	......	....	3
4	Alpena	....	11,12	....	5,10	....	4,6	....	......	29	3
5	Grand Haven	2,17,22	8,14	8,20,28	2	16	4,9,30	12	2,7,28	17,18	3,5
		....	....	....	......	....	......	....	30	....	...
6	Thornville	....	....	....	......	....	13	....	......	....	5
7	Ionia	4	11	....	......	....	......	....	......	....	3
8	Lansing	10	7,11,14	....	6	1	30	21,22,30	......	11,16	...
9	Swartz Creek	....	3,7,11	....	6,10	10	......	18,21,30	2	29	3
		....	12,14,16	....	......	....	......	....	......	....	...
10	Hudson	....	11	....	......	....	......	....	......	....	...
11	Kalamazoo	....	....	....	......	....	......	....	......	11	3
12	Ann Arbor	....	....	....	......	....	......	....	......	....	...
13	Tecumseh	....	....	....	......	....	......	....	......	....	...
14	Boyne City	....	....	....	......	....	......	....	......	....	...
15	Moorestown	....	....	....	......	....	......	....	......	....	...

DEC.—Clear, 1, 4, 18, and 19,—4 days. Cloudy, 3, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 20, 21, 23, 24, 25, 27, 28, 29, 30, and 31,—23 days.

In the following statement is named the number of days in each of the months "clear" (80 per cent. or more of sunshine), and the days "all or nearly all cloudy" (80 per cent. or more), in 1884, as observed by G. G. Gordon, M.D., at Swartz Creek.

JAN.—Clear days, 7,—cloudy, 17.
FEB.—Clear days, 4,—cloudy, 18.
MARCH.—Clear days, 12,—cloudy, 10.
APRIL.—Clear days, 8,—cloudy, 1.
MAY.—Clear days, 15,—cloudy, 8.
JUNE.—Clear days, 21,—cloudy, 3.
JULY.—Clear days, 19,—cloudy, 3.
AUGUST.—Clear days, 23,—cloudy, 4.
SEPT.—Clear days, 24,—cloudy, 4.
OCT.—Clear days, 16—cloudy, 10.
NOV.—Clear days, 10,—cloudy, 13.
DEC.—Clear days, 3,—cloudy, 20.

In the following statement are named the days of the month, "pleasant, unpleasant," etc., from Feb. to Dec., 1884, inclusive, as observed by J. W. Kimball, at Port Austin. There is also stated for each month the number of such days, as thus determined.

FEB.—Pleasant, 1, 2, 3, 4, 5, 6, 7, 8, 9, 11, 16, 17, 25, 26, and 27,—15 days. Fine, 10, 15, 18, 19, and 23,—5 days. Fair, 14 and 28.

Recorded on the Monthly Registers in 1884.

Months in 1884.

June.		July.		August.		September.		October.		November.		December.		Line Number.
Solar.	Lunar.	Solar.	Lunar.	Solar.	Lunar.	Solar.	Lunar.	Solar.	Lunar.	Solar.	Lunar.	Solar.	Lunar.	
2,9,18	7	7,11,12				1,5,14		10,17,28		3,13,15	4,7	19,21,23	3,4	
20,21						21,22,26				19		24		2
						30								
														3
	2						3							4
	12	11	28		2,10,13		1,26	9,10,26	5,6,25	7	4			5
					27				28,29					
								7						6
									29		1			7
					27		30		29		29			8
	1				26		29,30		6,29		30		26	9
				24			30							10
									29					11
						11				13				12
													26	13
													3	14
													1	15

MARCH.—Pleasant, 6, 18, and 20,—3 days. Fine, 4, 5, 9, 10, 11, 13, 14, 15, 16, 17, 21, 22, 23, 24, 27, 28, and 30,—17 days. Clear and cold, 1. Changeable, 8. Rough, 12 and 29.

APRIL.—Pleasant, 7, 10, and 22,—3 days. Fine, 1, 4, 5, 6, 9, 11, 12, 13, 14, 18, 19, 23, 24, 25, 26, 28, 29, and 30,—18 days. Fair, 27. Clear, 21. Rough, 2 and 20.

MAY.—Pleasant, 14, 16, 22, 24, and 30,—5 days. Fine, 3, 5, 6, 8, 9, 10, 12, 17, 18, 20, 21, 23, 25, 26, and 31,—15 days. Fair, 11, 28, and 29. Misty, 2, 7, and 19.

JUNE.—Pleasant, 14 and 15. Fine, 1, 2, 3, 4, 5, 6, 7, 8, 10, 11, 12, 16, 17, 18, 19, 20, 21, 22, 23, 26, 27, 28, 29, and 30,—24 days. Disagreeable, 9. Stormy, 24. Rough, 25.

JULY.—Pleasant, 16. Fine, 1, 2, 3, 5, 7, 8, 9, 10, 11, 12, 13, 14, 17, 18, 19, 20, 21, 22, 23, 25, 26, 27, 28, 29, 30, and 31,—26 days.

AUGUST.—Pleasant, 4, 7, and 28. Fine, 1, 2, 3, 5, 6, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20, 21, 22, 23, 24, 26, 27, 29, and 30,—26 days. "But one-half inch of rain fell during the month. Everything is drying up. The large maple shade trees are shedding their leaves. Some of them have cast off their entire leaf."

SEPT.—Fine, 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20, 22, 24, 25, 26, 27, 29, and 30,—27 days.

OCT.—Pleasant, 10, 12, 15, 26, 27, 28, 29, and 30,—8 days. Fine, 9, 13, 14, 16, 17, 18, 19, 20, 21, and 25,—10 days. Unpleasant, Oct. 22. Cloudy, Oct. 11.

NOV.—Pleasant, 2, 4, 7, 10, 11, 27, 28, and 29,—8 days. Fine, 3, 8, 9, 12, 13, 14, 15, 16, 20, 21, and 30,—11 days. Unpleasant, Nov. 26. Rough, 5, 6, 17, 24, and 25,—5 days. Stormy, Nov. 23.

DEC.—Pleasant, 9, 10, 11, 12, 13, 14, 20, 21, 22, 23, and 29,—11 days. Fine, 1, 2, 3, 4, 5,—5 days. Fair, Dec. 19. Misty, 28 and 30. Rough, Dec. 8.

TABLE VII.—*Inches of Rain and Melted Snow for the Year and for each Month of the Year 1884, at 20 Stations in Michigan,—as compiled from Daily Observations made by Observers* for the State Board of Health, and for the U. S. Signal Service.*

Stations in Michigan.* (Those of the U. S. Signal Service in italics.)	Divisions of the State.†	Inches of Rain and Melted Snow.													
		Year.		Months, 1884.											
		Norm. ‡	1884.	Jan.	Feb.	Mar.	Apr.	May.	June	July.	Aug.	Sept.	Oct.	Nov.	Dec.
Av. for 20 stations.	....	......	37.02	2.07	3.52	2.42	2.33	3.21	2.95	3.16	2.05	3.49	4.66	2.21	4.95
Marquette..........	U. P.	33.28^{13}	41.16	.91	2.05	.36	3.94	2.43	1.21	2.45	5.46	4.91	6.02	2.77	8.65
Manistique	U. P.	......	39.98	.94	4.47	.84	2.32	1.76	.97	3.47	4.50	6.63	6.38	2.65	5.05
Escanaba..........	U. P.	35.90^{13}	43.13	.55	2.75	1.10	2.60	2.69	2.52	3.01	4.71	8.77	7.97	2.12	4.34
Traverse City.....	N. W.	43.65^{3}	43.24	3.14	3.07	2.29	3.12	2.11	2.79	5.78	2.35	3.69	5.74	2.86	6.30
Mackinaw City....	N.	......	40.21	8.09	5.10	1.21	.99	1.67	2.27	2.51	3.28	1.96	3.85	2.80	6.48
Alpena............	N. E.	37.97^{12}	35.38	3.07	2.78	1.59	.75	3.27	2.67	2.37	2.65	4.80	3.72	2.14	5.57
Grand Haven	W.	41.58^{9}	46.61	2.83	2.72	3.86	3.83	3.59	3.82	4.01	2.29	4.15	6.10	2.61	6.80
Reed City	W.	40.04^{6}	40.85	1.53	3.18	1.98	2.63	4.61	4.04	4.84	1.04	4.67	4.54	2.72	5.07
Port Huron........	B. & E.	34.54^{10}	28.61	1.63	3.16	1.84	2.55	1.60	2.86	1.99	1.18	1.80	4.70	2.30	3.00
Thornville..........	B. & E.	34.89^{8}	36.37	1.79	3.51	3.37	1.97	2.78	3.76	4.30	1.47	3.32	5.38	1.59	3.13
Agr'l College......	C.	32.35^{21}	36.28	1.23	3.69	3.67	1.95	3.95	2.83	2.60	1.30	3.34	5.73	1.84	4.15
Ionia...............	C.	39.40^{2}	35.31	2.24	3.37	3.51	2.16	2.81	2.93	3.02	.55	3.26	4.30	1.91	5.25
Lansing............	C.	39.86^{5}	36.21	1.92	3.24	3.71	2.12	4.34	3.09	3.24	1.34	2.71	6.13	1.60	2.77
Swartz Creek......	C.	......	34.81	1.09	3.00	3.99	2.07	3.17	3.50	5.24	.95	2.01	4.69	1.91	3.19
Battle Creek.......	S. C.	......	32.59	1.00	4.66	2.13	3.30	4.20	1.45	1.07	1.13	1.75	2.96	1.70	7.24
Hillsdale...........	S. C.	37.51^{3}	33.47	1.11	4.36	2.48	1.70	4.13	5.39	1.06	.62	2.64	3.43	2.41	4.14
Kalamazoo.........	S. C.	40.12^{8}	38.47	2.69	3.97	3.42	2.13	3.96	4.06	2.66	1.76	2.39	2.88	1.69	6.86
Marshall............	S. C.	40.47^{4}	37.13	1.55	3.64	2.60	2.98	3.83	4.72	3.73	1.08	1.96	3.77	2.83	4.44
Tecumseh	S. C.	40.46^{5}	32.39	1.90	4.30	2.42	1.99	4.88	2.18	2.08	1.69	2.37	3.01	2.05	3.52
Detroit.............	S. E.	35.51^{13}	28.16	2.08	3.29	2.10	1.54	2.38	1.92	3.76	1.64	2.70	1.96	1.74	3.05

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* The names of observers, their places of observation, and the counties in which these places are situated, are stated in Exhibit 1, page 6.

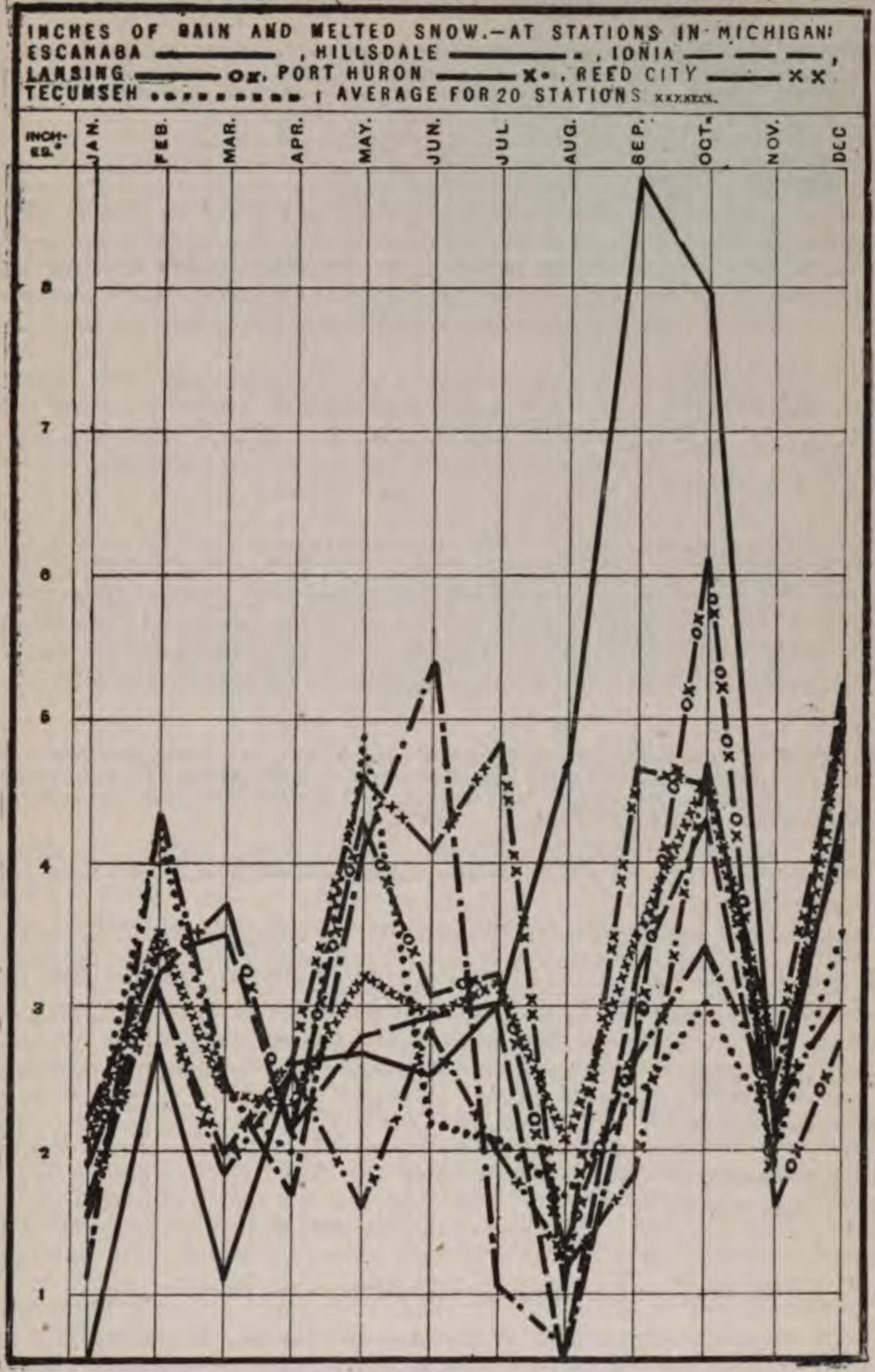
† The names of divisions, and the counties in each are stated in Exhibit 1, in a paper which follows, on weekly reports of diseases.

‡ Numbers in this column state the average annual rainfall for periods of years ending in each case with Dec. 31, 1884. The small figures above and at the right of numbers which state the rain-fall, denote the number of years included in the average.

NOTE.—Computations of amount of rain-fall were furnished by the observers at Escanaba, Mackinaw City, Alpena, Grand Haven, Port Huron, Ionia except for June, and Detroit, except for Feb., for the year; at Marquette, Jan. and April, and June to Dec., inclusive. All other computations in Table VII., were made in the office of the Secretary of State and the State Board of Health.

The lines for 7 representative stations in Table VII. are graphically represented in Diagram VII., page 55.

DIAGRAM VII.—RAINFALL, BY MONTHS IN 1884.



*SCALE, 1 IN. RAINFALL TO .77 IN. VERTICALLY.

H. B. T. DEL. DES. BY H. B. B.

EXHIBIT 22.—*Inches of Rain and Melted Snow by Years and Months, in 1884, compared with Annual and Monthly Average for 1883, and for the Eight Years, 1877-84. These Averages are for Groups of several Stations in Michigan.**

Years, Etc.	Inches of Rain and Melted Snow.												
	Annual Av.	Jan.	Feb.	Mar.	April.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
Av. 8 yr's, 1877-84.*....	37.97	1.91	2.73	2.65	2.71	3.60	4.51	3.97	3.23	3.43	3.86	3.38	2.81
1883 (19 stations*)......	40.91	1.91	4.14	1.02	1.81	6.02	7.41	6.27	1.06	2.37	3.34	3.89	1.67
1884 (20 stations*).......	30.85	2.06	3.52	2.42	2.33	3.21	2.95	3.16	2.05	3.49	4.61	2.21	4.95
In 1884 **Greater** than Av. for 8 yr's, 1877-84.	......	.15	.79	......	......	......	......	......	......	.06	.75	......	2.14
In 1884 **Less** than Av. for 8 years, 1877-84....	7.12	......	......	.23	.38	.39	1.56	.81	1.18	......	......	1.17	......
In 1884 **Greater** than in 1883..................	......	.15	......	1.40	.52	......	......	......	.99	1.12	1.27	......	3.28
In 1884 **Less** than in 1883..................	10.06	......	.62	......	......	2.81	4.46	3.11	......	......	......	1.68	......

* Thornville, Kalamazoo, and Detroit for the 8 years 1877-84; Mendon for 1877, 1878 and the 3 years 1880-82; Tecumseh for the years 1877 and 1878, and the 5 years 1880-84; Niles for the 4 years 1878-81; Nirvana, Coldwater and Woodmere Cemetery for the 3 years 1877-79; Agricultural College for 1877, 1878 and the 4 years 1881-84; Otisville for the 3 years 1878-80, and for 1882; Marquette, Alpena, Grand Haven, and Port Huron for the 6 years 1879-84; Battle Creek for 1877, 1878 and 1884; Benton Harbor for 1877 and 1878; Escanaba and Lansing for the 5 years 1880-84; Washington for the 4 years 1880-83; Fife Lake and Ypsilanti for 1877; Harrisville for 1881 and 1882; Reed City and Marshall for the 4 years 1881-84; Winfield for the 3 years 1881-83; Ann Arbor for 1881 and 1882; Hudson and Mallory Lake for 1881; Traverse City and Hillsdale for the 3 years 1882-84; Hastings for 1882; Parkville for 1882 and 1883; Ionia for 1883 and 1884; Manistique, Mackinaw City and Swartz Creek for 1884.

EXHIBIT 23.—*Comparison of the Rainfall during the Year and during each Month of the Year 1884, with that for the Year 1883; and with the Average for the Twenty Years, 1864-83. Observations made by Prof. R. C. Kedzie, at the State Agricultural College, near Lansing, Michigan.*

Years, Etc.	Inches of Rain and Melted Snow.												
	Year.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
Av. 20 years, 1864-83....	32.15	1.72	1.95	2.64	2.53	3.13	4.37	3.69	2.74	2.86	2.52	2.25	1.80
1883....................	48.44	1.53	4.50	.71	1.90	5.66	11.35	11.27	.18	2.34	3.66	3.98	1.36
1884....................	36.28	1.23	3.69	3.67	1.95	3.95	2.83	2.60	1.30	3.34	5.73	1.84	4.15
In 1884 **Greater** than av. for 20 years, 1864-83..................	4.13	......	1.74	1.03	......	.82	......	......	......	.48	3.21	......	2.35
In 1884 **Less** than av. for 20 years, 1864-83..	......	.49	......	......	.58	......	1.54	1.09	1.44	......	......	.41	......
In 1884 **Greater** than in 1883..................	......	......	......	2.96	1.05	......	......	......	1.12	1.00	2.07	......	2.79
In 1884 **Less** than in 1883..................	12.16	.30	.81	......	......	1.71	8.52	8.67	......	......	......	2.14	......

OZONE TEST-PAPER,—RELATIVE SENSITIVENESS OF NEW SUPPLY.

All ozone test-papers used by the observers for this Board previous to April 1, 1884, were prepared at the Michigan State Agricultural College, either by Prof. R. C. Kedzie, Robert F. Kedzie, or F. S. Kedzie. It was prepared in lots at different times (March 1, 1876, April 10, 1877, Feb. 1, 1878, Jan. 1879, Jan. 1880, Dec. 1880, April 7, 1882, Feb. 16, 1884, March 9, 1885), and sometimes one lot would differ slightly in sensitiveness from the last preceding lot. No systematic corrections for sensitiveness of paper had been attempted heretofore; but such close relations have been found between the curves representing ozone (or the oxidizers present in the atmosphere which color the test-paper), and the curves representing certain diseases such, for instance, as pneumonia, that it seems desirable to perfect the details of the observations of ozone as fast as possible. For this reason, and because the last supply of test-paper was not prepared by the same person, a comparison was instituted to ascertain its relative sensitiveness.

EXHIBIT 24.—*Comparison of results of Observations of Ozone with two samples of test-paper (Schönbein's Formula) at 7 A.M., 2 P.M., aud 9 P.M. daily, for the months of April and May, 1884, at the Office Window of the Secretary of the State Board of Health, Lansing. One sample prepared by Prof. J. H. Long, Chicago, and one by Prof. F. S. Kedzie, at the Agricultural College, Lansing.**

Months, 1884.	7 A.M. to 2 P.M.			2 P.M. to 9 P.M.			9 P.M. to 7 A.M.		
	By paper prepared by Prof. Kedzie.	By paper prepared by Prof. Long.	Greater(+) by Prof. Kedzie's than by Prof. Long's.	By paper prepared by Prof. Kedzie.	By paper prepared by Prof. Long.	Greater (+) by Prof. Kedzie's than by Prof. Long's.	By paper prepared by Prof. Kedzie.	By paper prepared by Prof. Long.	Greater (+) by Prof. Kedzie's than by Prof. Long's.
Av. for 2 Months	2.76	2.59	+ 0.17	2.95	2.60	+ 0.34	3.44	3.31	+ 0.12
April	2.63	2.50	+ 0.13	2.67	2.53	+ 0.14	3.27	3.23	+ 0.04
May	2.90	2.69	+ 0.21	3.23	2.68	+ 0.55	3.61	3.40	+ 0.21

*These are original figures. No subtractions are needed for this exhibit. It is the original exhibit showing the difference in sensitiveness between the test-papers prepared by Prof. Long and Prof. Kedzie.

The Schönbein test-paper used for observations during 1884, the results of, which appear in Exhibit 25, page 59, and in the line for Lansing in Tables VIII. and IX., pages 65 and 67, also for Lansing (one of the 20 stations) in Exhibits 27 and 28, page 63, in this Report, was prepared by Prof. F. S. Kedzie, of the Agricultural College, Michigan. The Schönbein test-paper prepared by Prof. Kedzie was also used by the observers at the other stations in 1884 until March 31. After March 31, Schönbein test-paper, prepared by Prof. J. H. Long, of Chicago, Ill., was used at all the stations except Lansing. The test-paper prepared by these two chemists was compared at the office of the Secretary of the State Board of Health, during the months of April and May, 1884. It was found that the test-paper prepared by Prof. Kedzie was the most sensitive, and gave an average degree of coloration of 0.17 more from 7 A. M. to 2 P. M., 0.34 more from 2P. M. to 9 P. M., and 0.12 more from 9 P. M. to 7 A. M., as shown by Exhibit 24, page 57. In order to make all the months in 1884 comparable with each other, the .17 and the .12 mentioned above were subtracted from the figures for the first three months in the tables for day and night ozone at all the stations, Lansing included; and for Lansing the subtraction for the other nine months in 1884 is shown in the foot-note to Tables VIII. and IX. It follows that in order to compare minutely the average ozone shown by the several tables and exhibits for the year 1884, with that for the preceding year, the .17 and .12 respectively, must be added to the figures for each month of 1884.

But, on the other hand, one more fact must be stated as to the observations at Lansing, which is that for the last six months in 1884 the observations were taken in the yard, in an instrument shelter; whereas, previous to that time, the observations had been taken at the office window. Comparative observations show that the indications of ozone were considerably greater in the yard than at the window, especially when the wind was from the northeast. This was because of the influence of the building, fires, lights, etc. In order to compare accurately the average ozone at Lansing in 1884 with that in preceding years, allowance must be made for the difference in place of observations during the last half of the year 1884. The amount of the difference in each month in 1883 is shown in Exhibit 33, page 176 of the Report for 1884; the average for the full year 1883 was 0.50 higher indications of ozone in the yard than at the office window, from 7 A. M. to 2 P. M, 0.47 from 2 P. M. to 9 P. M., and 0.51 from 9 P. M. to 7 A. M. observations. Further evidence on this subject is given in Exhibit F, page 61 of this report, which shows the difference in each of the first six months in 1884 to have been very much the same as in 1883, except during the nights. The average for the first six months in 1884 was 0.52 more ozone indicated in the yard than at the office window from 7 A. M. to 2 P. M., 0.46 more from 2 P. M. to 9 P. M., and 1.02 more from 9 P. M. to 7 A. M. The diagram representing the day ozone was made from the table for day ozone (7 A. M. to 2 P. M. observations) with the 0.17 subtracted from the figures for the first three months at all the stations included in it, and before the subtraction of the 0.17 had been made from each of the remaining months in 1884 at Lansing, consequently the curve for Lansing and the "average for stations" curve for each of the months, April to December inclusive, reads 0.17 higher in the diagram than the figures in the foot-notes to the tables for those months. The corresponding curves in the diagram representing night ozone for the same months in 1884 reads 0.12 higher than the figures in the foot-note to the table for night ozone.

OBSERVATIONS FOR OZONE AT LANSING.

Observations for ozone at Lansing for the first six months in 1884 were taken at the office window, and for the last six months at the new shelter for instruments. As shown by Exhibit 25, more ozone was indicated at the office window for the first six months than at the instrument shelter in the yard for the last six months; by the Schönbein test, the average was 0.45 more from 9 P. M. to 7 A. M., 0.37 more from 7 A. M. to 2 P. M., and 0.74 more from 2 P. M. to 9 P. M.; by the thallium test, the average was 0.48 more from 9 P. M. to 7 A. M., 0.02 more from 7 A. M. to 2 P. M., and 0.04 more from 2 P. M. to 9 P. M. So far as relates to the two places of observation, this is not the same result as was found true for 1883, when, as shown in Exhibit 33, page 176, Report for 1884, it appeared that throughout the year more ozone was indicated in the yard than at the office window. Comparisons for the month of July, 1884, with both thallium and Schönbein tests in Exhibit E, page 60, show greater indications of ozone at the instrument shelter in the yard than at the office window. Therefore, more ozone was undoubtedly present in the atmosphere at Lansing for the first six months than for the last six months in 1884. In Tables VIII and IX, the lines, "average for 20 stations," show more ozone in the first than in the last six months of 1884, throughout the State.

By both tests, by day and night observations (from 7 A. M. to 2 P. M. and from 9 P. M. to 7 A. M.), for each month in 1884, in which observations were made by both tests, the indications of the presence of ozone at Lansing were comparatively slight during the days in November, and during the nights in June. By the thallium test at Lansing, comparatively great indications were obtained by day in January, July and August; and by night during January, May and March. By the iodide of potassium and starch test (Schönbein's), the greatest indications at Lansing by day were obtained in January, May and August; and by night during January, March and May.

EXHIBIT 25.—*Results of Observations for Ozone by means of Thallium Test-paper and by means of Test-paper prepared by Schönbein's Formula. Monthly Averages for the Year and for Months in the Year 1884, at Lansing, Mich.*

Months, 1884.		Average Degree of Coloration.*								
		Observations from 9 P. M. to 7 A. M.			Observations from 7 A. M. to 2 P. M.			Observations from 2 P. M. to 9 P. M.		
		With Schonbein's Test-paper.	With Thallium Test-paper.	Greater (+) or less (-) with Thallium than by Schonbein's Test-paper.	With Schonbein's Test-paper.	With Thallium Test-paper.	Greater (+) or less (-) with Thallium than by Schonbein's Test-paper.	With Schonbein's Test-paper.	With Thallium Test-paper.	Greater (+) or less (-) with Thallium than by Schonbein's Test-paper.
Average for Year		3.39	1.93	-1.46	2.83	1.80	-1.03	2.39	1.79	-0.60
Average for first 6 months		3.61	2.17	-1.44	3.01	1.81	-1.20	2.76	1.81	-0.95
Average for last 6 months		3.16	1.69	-1.47	2.64	1.79	-0.85	2.02	1.77	-0.25
Observations at Office Window.	January	4.39	2.48	-1.91	4.29	2.71	-1.58	3.97	2.03	-1.94
	February	3.59	1.83	-1.76	3.00	1.28	-1.72	2.86	1.38	-1.48
	March	4.13	2.26	-1.87	2.94	1.35	-1.59	2.13	1.45	-0.68
	April	3.27	2.17	-1.10	2.63	1.57	-1.06	2.67	1.79	-0.88
	May	3.61	2.65	-0.96	2.90	2.29	-0.61	3.23	2.55	-0.68
	June	2.67	1.60	-1.07	2.30	1.67	-0.63	1.70	1.63	-0.07
Observations at Ins't. Shelter in Yard.	July	3.90	2.35	-1.55	2.94	3.16	+0.22	2.35	3.03	+0.68
	August	3.42	1.56	-1.86	3.03	2.55	-0.48	2.19	2.42	+0.23
	September	2.80	1.20	-1.60	2.83	2.00	-0.83	1.73	1.50	-0.23
	October	3.39	1.87	-1.52	2.52	1.16	-1.36	1.94	1.26	-0.68
	November	2.70	1.60	-1.10	2.23	0.60	-1.63	1.90	1.13	-0.77
	December	2.77	1.55	-1.22	2.29	1.26	-1.03	2.00	1.26	-0.74

* By a scale of 10 degrees of coloration,—Maximum=10.

This exhibit—25—is in continuation of observations begun in March, 1882, for an account of which see pages 172 and 175 of Annual Report of Michigan State Board of Health for the year 1883, and page 178 of the Report for 1884.

OZONE TESTS IN OPEN FIELD COMPARED WITH THOSE NEAR A BUILDING.

In Exhibit E, page 60 of this Report, is a comparison by the use of thallium test-paper for ozone during the month of July, 1884, which shows more ozone in the Capitol yard than at the office window, the average for the month being 0.51 more (degrees of coloration, on the scale of ten) from 7 A. M. to 2 P. M., 0.29 more from 2 P. M. to 9 P. M., and 0.35 more from 9 P. M. to 7 A. M. In the same exhibit is a comparison for the same month, by the use of Schönbein test-paper, it being 0.42 more from 7 A. M. to 2 P. M., 0.45 more from 2 P. M. to 9 P. M., and 1.03 more from 9 P. M. to 7 A. M.

In Exhibit F., page 61 of this Report, is a comparison by the use of Schönbein test-paper for ozone during the first six months of 1884, which shows more ozone in the Capitol yard than at the office window, the average being 0.52 more (on the scale of ten) from 7 A. M. to 2 P. M., 0.46 more from 2 P. M. to 9 P. M., and 1.02 more from 9 P. M. to 7 A. M.

EXHIBIT E.—*Comparison of results of Observations for Ozone with Thallium, and also with Schönbein's Test-paper exposed in a shelter for Meteorological Instruments placed in the Capitol Yard, with the results obtained by Observations at the same time at the window of the Office of the Secretary of the State Board of Health, during the month of July, 1884, for the purpose of learning the influence that the Building has on each of the Test-papers.*

	7 A. M. to 2 P. M.			2 P. M. to 9 P. M.			9 P. M. to 7 A. M.		
	At Office, S. W. Side.	In Yard, S. W. of Capitol.	Greater (+) in the Yard than at Office Window.	At Office, S. W. Side.	In Yard, S. W. of Capitol.	Greater (+) in the Yard than at Office Window.	At Office, S. W. Side.	In Yard, S. W. of Capitol.	Greater (+) in the Yard than at Office Window.
Thallium, Av. for July, 1884...	2.65	3.16	+ 0.51	2.74	3.03	+ 0.29	2.00	2.35	+ 0.35
Schönbein, Av. for July, 1884..	2.52	2.94	+ 0.42	1.90	2.35	+ 0.45	2.87	3.90	+ 1.03

EXHIBIT F.—*Special Ozone observations made at the same time at the Office Window, Southwest side of the Michigan State Capitol Building, and in the Yard, southwest of the Building, with Test-paper prepared by Schönbein's Formula, for the first six months of the Year 1884, for the purpose of learning the influence that Furnace Gas and the building has on the Schönbein Test-paper.*

Months, 1884.*	9 P. M. to 7 A. M.			7 A. M. to 2 P. M.			2 P. M. to 9 P. M.		
	At Office, S. W. side.	In Yard, S. W. of Capitol.	Greater(+) or less (-) in the yard than at Office Window.	At Office, S. W. side.	In Yard, S. W. of Capitol.	Greater(+) or less (-) in the yard than at Office Window.	At Office, S. W. side.	In Yard, S. W. of Capitol.	Greater(+) or less (-) in the yard than at Office Window.
Average for 6 months*	3.61	4.63	+1.02	3.01	3.53	+0.52	2.76	3.24	+0.46
January	4.39	4.83	+0.44	4.29	4.48	+0.19	3.97	4.00	+0.03
February	3.59	5.28	+1.69	3.00	3.48	+0.48	2.86	4.00	+1.14
March	4.13	5.07	+0.94	2.94	3.87	+0.93	2.13	2.90	+0.77
April	3.27	4.07	+0.80	2.63	3.43	+0.80	2.67	2.93	+0.26
May	3.61	4.71	+1.10	2.90	3.35	+0.45	3.23	3.50	+0.17
June	2.67	3.80	+1.13	2.30	2.57	+0.27	1.70	2.10	+0.40

* It is readily seen that the average degree of coloration for the six months in 1884 is higher in the yard than at the office window.

The test-paper used for the observations upon which Exhibit F is based was prepared by Prof. F. S. Kedzie, and the results are comparable with Exhibit 33, page 176, Report for 1884. The subtractions of .17, .34 and .12 from the 7 A. M., 2 and 9 P. M. observations, respectively, which were made for other exhibits and tables in this Report, were not made for this exhibit.

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EXHIBIT G.—*Comparison of results of Observations for Ozone for the month of July, 1884, with Test-paper prepared by Schönbein's Formula exposed at the same time on a post with sheltered top, and in a more enclosed shelter for Meteorological Instruments in the Southwest part of the Capitol yard, Lansing.*

	Average Degree of Coloration.								
	From 7 A. M. to 2 P. M.			From 2 P. M. to 9 P. M.			From 9 P. M. to 7 A. M.		
	In Shelter for Instruments.	At Post.	More (+) at Shelter for Instruments.	In Shelter for Instruments.	At Post.	More (+) at Shelter for Instruments.	In Shelter for Instruments.	At Post.	More (+) at Shelter for Instruments.
Average for July, 1884	2.94	2.58	+0.36	2.35	1.97	+0.38	3.90	3.84	+0.06

In Exhibit G the greater indications of ozone at the day observations at the place most exposed to daylight, and the nearly equal results in both places at night, seem to indicate that the difference was due to the action of light on the paper exposed at the post. Prof. Kedzie has shown, however, that light alone in the absence of the oxygen of the air does not color the Schönbein test-paper.

COMPARISON OF THALLIUM AND SCHÖNBEIN TESTS FOR ATMOSPHERIC OZONE.

In Exhibit 36, page 175, Report for 1883, is a comparison for the last ten months in 1882, of results of observations for ozone by means of iodide of potassium and starch paper prepared by Schönbein's formula, with those by means of thallium paper. In Exhibit 35, page 178, Report for 1884, is a comparison for each month in 1883. In Exhibit 25, page 59, of this Report, is a comparison for each month in 1884. The observations, however, were taken for the first six months at the office window, and for the last six months at an instrument shelter placed in the capitol yard. The exhibit shows an average line for the full year 1884, an average line for the first six months, and an average line for the last six months. The thallium test-paper was prepared by Prof. J. H. Long, of the Chicago Medical College, Illinois. The Schönbein test-paper was prepared by Prof. F. S. Kedzie, of the Agricultural College, Michigan.

EXHIBIT 26—*Comparison of Results of Observations at Lansing, Michigan, for Ozone, by means of Thallium Test-paper*, with Results of Observations by means of Test-paper prepared by Schönbein's Formula. During the first six months the Schönbein Test-paper was exposed on a post with sheltered top, and the Thallium Test-paper at the Office Window. During the last six months the two kinds of Test-paper were exposed in a more enclosed shelter for Meteorological Instruments. The post and the shelter for Instruments were in the Southwest part of the Capitol Yard. Averages for the Year and for Months in the Year 1884.*

Months, 1884.		Average Degree of Coloration.								
		Observations from 9 P. M. to 7 A. M.			Observations from 7 A. M. to 2 P. M.			Observations from 2 P. M. to 9 P. M.		
		With Schonbein's Test-paper.	With Thallium Test-paper.	Greater (+) or less (−) with Thallium than by Schonbein's Test-paper.	With Schonbein's Test-paper.	With Thallium Test-paper.	Greater (+) or less (−) with Thallium than by Schonbein's Test-paper.	With Schonbein's Test-paper.	With Thallium Test-paper.	Greater (+) or less (−) with Thallium than by Schonbein's Test-paper.
Average for Year		3.90	1.93	-1.97	3.09	1.80	-1.29	2.63	1.79	-0.84
Schonbein paper exposed on post. Thallium exposed at office window.	January	4.83	2.48	-2.35	4.48	2.71	-1.77	4.00	2.03	-1.97
	February	5.28	1.83	-3.45	3.48	1.28	-2.20	4.00	1.38	-2.62
	March	5.07	2,26	-2.81	3.87	1.35	-2.52	2.90	1.45	-1.45
	April	4.07	2.17	-1.90	3.43	1.57	-1.86	2.93	1.79	-1.14
	May	4.71	2.65	-2.06	3.35	2.29	-1.06	3.50	2.55	-0.95
	June	3.80	1.60	-2.20	2.57	1.67	-0.90	2.10	1.63	-0.47
Schonbein and Thallium tests made in shelter for instruments.	July	3.90	2.35	-1.55	2.94	3.16	+0.22	2.35	3.03	+0.68
	August	3.42	1.56	-1.86	3.03	2.55	-0.48	2.19	2.42	+0.23
	September	2.80	1.20	-1.60	2.83	2.00	-0.83	1.73	1.50	-0.23
	October	3.39	1.87	-1.52	2.52	1.16	-1.36	1.94	1.26	-0.68
	November	2.70	1.60	-1.10	2.23	0.60	-1.63	1.90	1.13	-0.77
	December	2.77	1.55	-1.22	2.29	1.26	-1.03	2.00	1.26	-0.74

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* Exhibit E, page 60, shows how much greater the indications of ozone, by the thallium test, were at the shelter for instruments than at the office window, for the month of July.

EXHIBIT 27.—*Average Amount of Atmospheric Ozone (Day) by Year and Months, in 1884, compared with Annual and Monthly Average for 1883 and for the eight Years 1877–84. These Averages are for Groups of several Stations in Michigan.**

Years, Etc.	Ozone by Day.—Degree of Coloration of Test Paper.												
	Annual Av.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
Av. 8 years, 1877-84.*	3.09	3.44	3.57	3.53	3.25	3.12	2.92	2.74	2.83	2.71	2.71	2.99	3.16
1883 (20 stations*)	3.19	3.88	4.01	3.49	3.30	3.31	3.06	2.91	2.63	2.65	2.87	2.97	3.25
1884 (20 stations*)	2.75	3.41	3.36	3.03	2.90	2.91	2.64	2.52	2.62	2.28	2.33	2.40	2.62
In 1884 **Greater** than Av. for 8 yr's, 1877-84	......	......	......	......	......	......	......	......	......	......	......	......	......
In 1884 **Less** than Av. for 8 yr's, 1877-84	0.34	0.03	0.21	0.50	0.35	0.21	0.28	0.22	0.21	0.43	0.38	0.59	0.54
In 1884 **Greater** than in 1883	......	......	......	......	......	......	......	......	......	......	......	......	......
In 1884 **Less** than in 1883	0.44	0.47	0.65	0.46	0.40	0.40	0.42	0.39	0.01	0.37	0.54	0.57	0.63

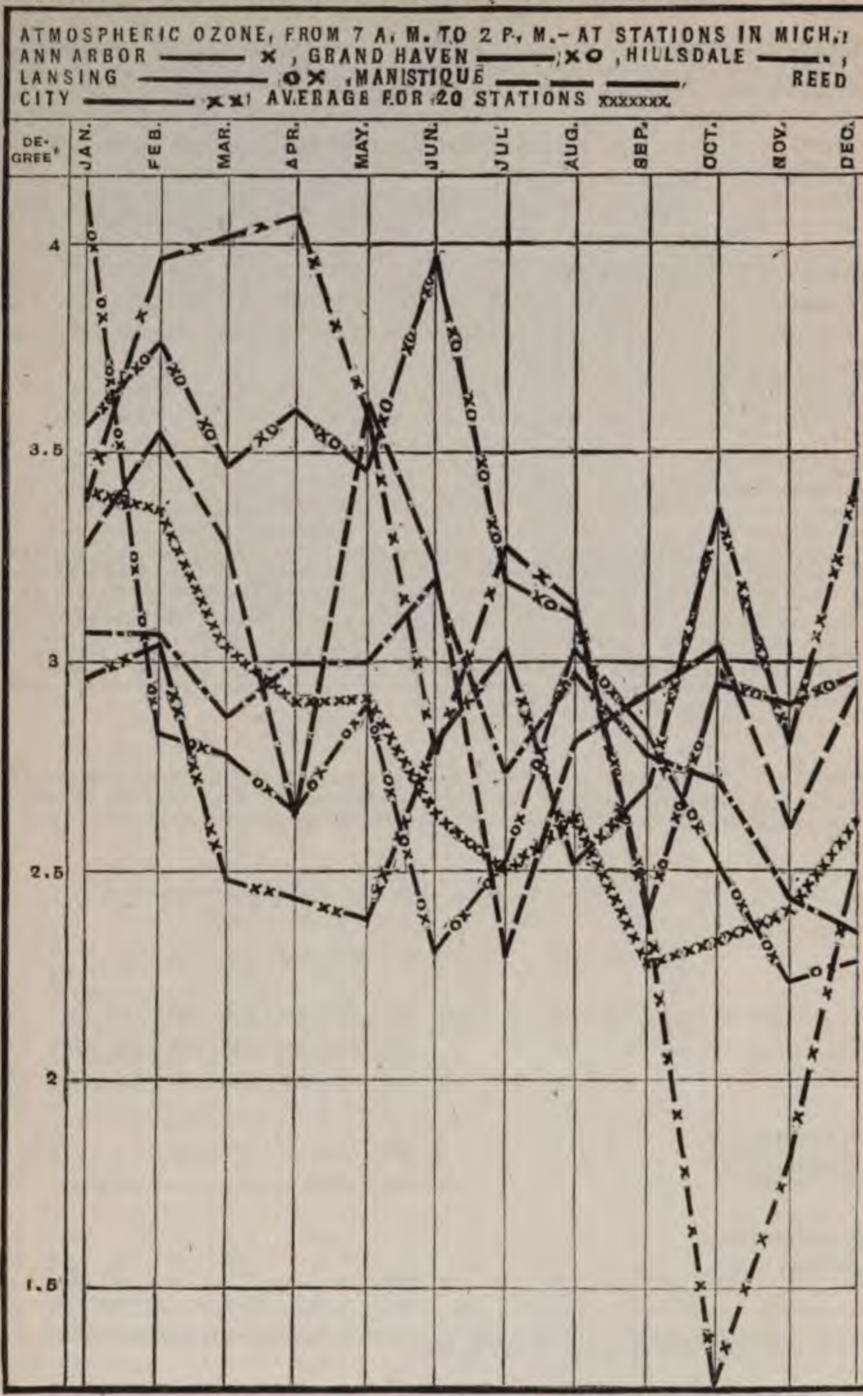
*Thornville, Kalamazoo and Tecumseh for the 8 years, 1877-84; Mendon for the 7 years, 1877-83; Battle Creek for the 4 years, 1877-80, and for 1882-84; Niles for the 4 years, 1878-81; Nirvana for the 3 years 1877-79; Coldwater and Agricultural College for 1877, 1878 and 1880; Otisville for the 3 years 1878-80 and 1882; Alpena and Lansing for the 6 years 1879-84; Washington for the 5 years 1879-83; Petoskey and Woodmere Cemetery for 1878 and 1879; Marquette for 1880, 1881, 1883 and 1884; Grand Haven and Ann Arbor for the 5 years 1880-84; Fife Lake and Ypsilanti for 1877; Ionia for 1880, 1883 and 1884; Adrian for 1880; Hudson and Mallory Lake for 1881; Escanaba, Reed City, Port Huron and Marshall for the 4 years 1881-84; Harrisville for 1881 and 1882; Traverse City and Hillsdale for the 3 years 1882-84; Hastings and Parkville for 1882; Port Austin for 1883 and 1884; Winfield for 1883; Manistique, Mackinaw City and Swartz Creek for 1884.

EXHIBIT 28.—*Average Amount of Atmospheric Ozone (Night), by Year and Months in 1884, compared with Annual and Monthly Average for 1883 and for the eight Years, 1877–1884. These Averages are for Groups of several Stations in Michigan.**

Years, Etc.	Ozone by Night—Degrees of Coloration of Test-Paper.												
	Annual Av.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
Av. for 8 y'rs, 1877-84*	3.18	3.96	4.11	4.17	3.54	3.27	2.91	2.45	2.28	2.35	2.87	3.31	3.55
1883—(20 Stations*)	3.47	4.55	4.55	3.87	3.65	3.81	3.12	2.80	2.40	2.61	3.28	3.22	3.74
1884—(20 Stations*)	3.11	3.98	4.30	3.73	3.09	3.28	2.70	2.62	2.62	2.42	2.74	2.80	3.07
In 1884 **Greater** than Av. for 8 y'rs, 1877-84	......	.02	.19	......	......	.01	......	.17	.34	.07	......	......	......
In 1884 **Less** than Av. for 8 years, 1877-84	.07	......	......	.44	.45	......	.21	......	......	......	.13	.51	.48
In 1884 **Greater** than in 1883	......	......	......	......	......	......	......	......	.22	......	......	......	......
In 1884 **Less** than in 1883	.36	.57	.25	.14	.56	.53	.42	.18	......	.19	.54	.42	.67

*The stations represented in Exhibit 28 are the same as those represented in Exhibit 27, relative to day ozone, and named in the foot-note of that Exhibit.

DIAGRAM VIII.—OZONE, AV. BY DAY, MONTHS IN 1884.



*SCALE, 1 DEG. OF COLORATION (ON SCALE OF 10 DEGS.) TO 2. 2 IN. VERTICALLY.

H. B. T., DEL. DES. BY H. B. B.

TABLE VIII.—*Relative Amount of Ozone in the Atmosphere, by Day, during Year, and during each Month of the Year 1884, at 20 Stations in Michigan,—as Indicated by Averages of Observations made Daily by Exposing Test-paper prepared according to Schönbein's formula, from 7 A. M. to 2 P. M.—Recorded according to a scale of 10 Degrees of Coloration of the Test-paper (greatest coloration by ozone equals 10) by Observers for the State Board of Health, and for the U. S. Signal service.**

Stations in Michigan.† (Those of U. S. Signal service in Italics.)	Divisions of the State.†	Degrees of Coloration of Test-paper—Day Observations.													
		Year.		Months 1884.											
		Norm. ‡	1884	Jan.	Feb.	Mar.	Apr.	May.	Jun.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
Av. for 20 Stations	....	......	2.75	3.41	3.36	3.03	2.90	2.91	2.64	2.52	2.62	2.28	2.33	2.40	2.62
Marquette	U. P.	2.19^{2}	1.84	2.38	2.38	1.83	2.10	2.32	1.50	1.71	1.52	1.57	1.52	1.60	1.65
Manistique	U. P.	......	3.02	3.28	3.55	3.28	2.63	3.61	3.23	2.30	2.81	$^{b}2.93$	$^{f}3.04$	2.60	2.94
Escanaba	U. P.	3.32^{4}	3.36	3.06	4.38	3.67	3.67	2.71	3.77	3.42	3.42	3.30	2.52	2.90	3.48
Traverse City	N. W.	2.66^{3}	2.17	3.15	3.62	3.09	2.87	2.35	1.57	1.84	1.26	1.10	1.39	1.57	2.26
Mackinaw City	N.	......	2.78	3.38	2.64	2.22	2.53	2.81	2.97	2.19	2.58	2.40	2.81	3.20	3.60
Alpena	N. E.	3.32^{6}	3.18	4.51	3.86	1.99	2.63	3.52	2.57	3.19	3.03	2.57	3.10	3.43	3.74
Grand Haven	W.	3.75^{5}	3.28	3.56	3.76	3.46	3.60	3.45	3.96	3.19	3.10	2.40	2.95	2.90	2.97
Reed City	W.	3.47^{6}	2.83	2.96	3.04	2.48	2.43	2.39	2.80	3.03	2.51	2.70	$^{a}3.37$	2.80	$^{a}3.43$
Port Austin	B. & E.	2.78^{2}	2.64	$^{f}3.48$	3.21	3.48	$^{b}3.17$	2.74	1.90	1.90	$^{a}2.40$	$^{b}1.90$	$^{e}2.25$	2.50	$^{b}2.79$
Port Huron	B. & E.	2.81^{4}	2.69	3.83	2.38	2.73	2.63	3.10	2.40	2.42	2.94	2.90	2.45	2.13	2.42
Thornville	B. & E.	2.71^{8}	2.55	4.09	3.66	3.44	2.40	2.29	1.77	1.74	1.71	1.80	2.26	2.57	2.84
Ionia	C.	2.22^{2}	1.96	1.37	2.14	2.37	3.00	3.00	3.07	2.25	2.51	1.06	0.90	1.03	0.77
Lansing ++	C.	3.37^{6}	2.78	4.12	2.83	2.77	2.63	2.90	2.30	2.94	3.03	2.83	2.52	2.23	2.29
Lansing **	C.	......	3.09	4.48	3.48	3.87	3.43	3.35	2.57	2.94	3.03	2.83	2.52	2.23	2.29
Swartz Creek	C.	......	3.58	4.73	5.47	4.47	3.55	3.47	2.67	$^{a}2.45$	3.05	2.68	3.10	3.78	3.48
Ann Arbor	S. C.	2.46^{5}	3.02	$^{b}3.38$	3.97	4.02	$^{b}4.07$	3.58	$^{d}2.78$	$^{c}3.28$	$^{a}3.13$	2.40	1.26	1.81	$^{b}2.50$
Battle Creek	S. C.	2.55^{3}	2.06	2.22	2.86	2.70	2.90	3.03	2.37	1.90	2.16	1.53	0.90	0.86	1.34
Hillsdale	S. C.	2.96^{3}	2.85	$^{b}3.07$	3.07	2.86	3.00	3.00	3.20	2.74	2.97	2.77	2.71	2.43	2.35
Kalamazoo	S. C.	2.72^{8}	2.45	3.18	3.76	2.89	2.20	2.10	2.03	2.06	2.19	1.93	2.00	2.43	2.61
Marshall	S. C.	3.90^{4}	3.63	4.48	3.73	3.44	3.57	3.65	3.63	3.81	4.10	3.63	3.58	2.87	3.06
Tecumseh	S. C.	3.32^{2}	2.39	3.99	2.80	$^{a}3.33$	2.43	2.16	2.27	2.06	$^{d}2.07$	1.23	2.06	2.43	1.81

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[a], [b], [c]. In the columns from January to December, inclusive, the letters [a], [b], [c], etc., stand directly above the numbers from which they refer to the notes below.

[a] For 30 days. [b] For 29 days. [c] For 28 days. [d] For 27 days. [e] For 24 days. [f] For 23 days.

* At the stations of the U. S. signal service the observations were made at 7 A. M., 3 P. M., and 11 P. M., Washington mean time. The corresponding local time for each of these stations is stated in the (*) foot-note to Table I, page 28.

† The names of observers, their places of observation, and the counties in which these places are situated, are stated in Exhibit 1, page 6. The full names of the divisions and the counties in each division are stated in Exhibit 1, in a paper which follows, on weekly reports of sickness.

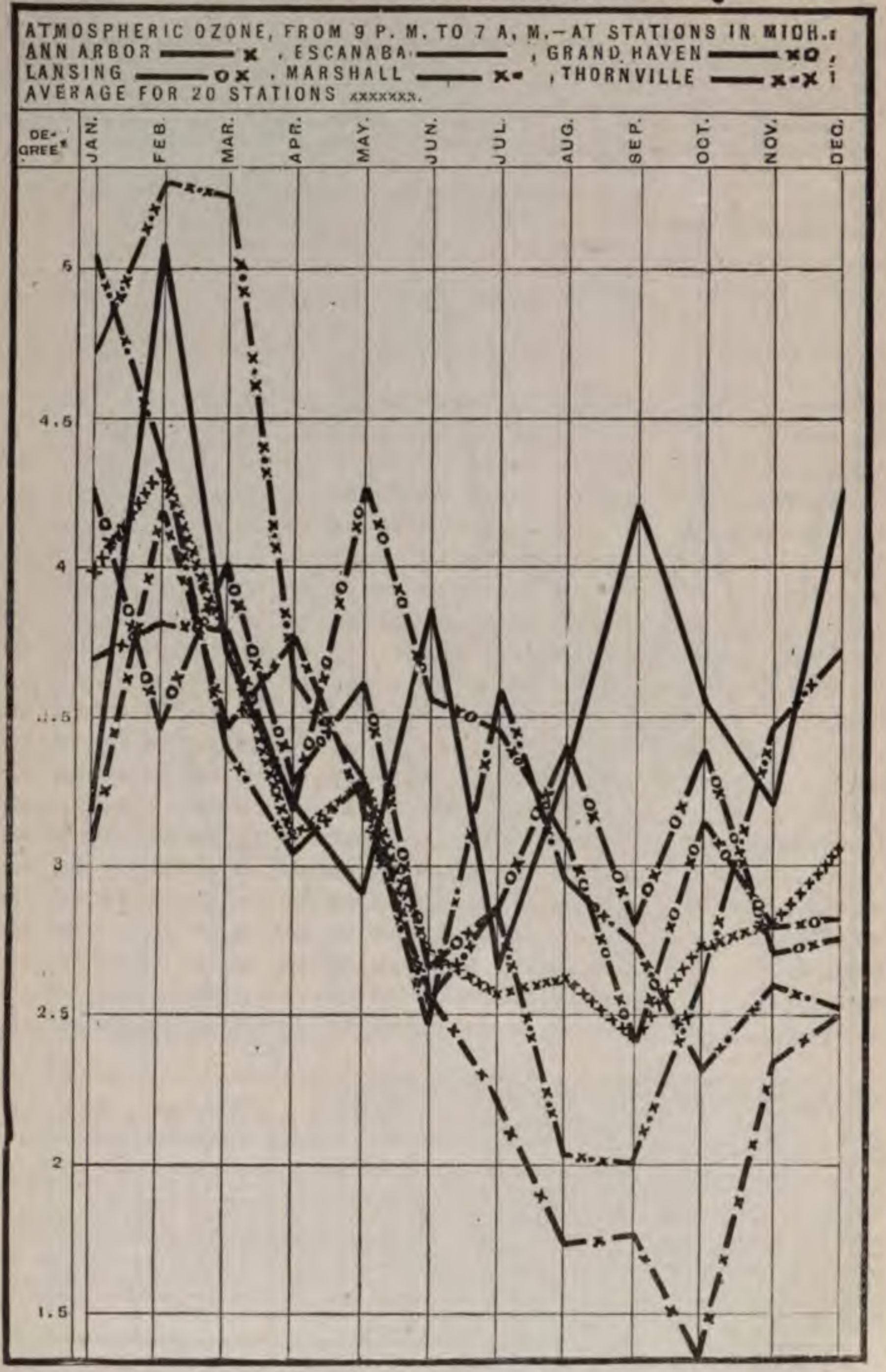
‡ Numbers in this column state the average annual relative amount of ozone by day for periods of years ending in each case with December 31, 1884. The small figures above and at the right of numbers which state the average, denote the number of years included in the average.

NOTE.—The computations were furnished by the observers at Escanaba and Grand Haven for the year; at Mackinaw City for Jan. and Feb., and Apr. to Dec. inclusive; at Ionia for Feb. to May and July to Dec. inclusive; at Ann Arbor for Feb., Mar., June, July, Aug., Oct., Nov. and Dec. All other computations for Table VIII. were made in the office of the State Board of Health.

** ++ See page 68 for (++) and (**) foot-note to this Table.

Six lines in this table are graphically represented in Diagram VIII., page 64.

DIAGRAM IX.—OZONE, AV. BY NIGHT, MONTHS IN 1884.



*SCALE. 1 DEG. OF COLORATION (ON SCALE OF 10 DEGS) TO 1.6 IN. VERTICALLY.
DES. BY H. B. B.

TABLE IX.—*Relative amount of Ozone in the Atmosphere at Night, during the Year, and during each Month of the Year 1884, at 20 Stations in Michigan,—as indicated by Averages of Observations made Nightly by Exposing Test-paper, prepared according to Schönbein's formula, from 9 P. M. to 7 A. M.,—Recorded according to a Scale of 10 Degrees of Coloration of the Test-paper (greatest coloration by Ozone equals 10), by Observers for the State Board of Health, and for the U. S. Signal Service.**

Stations in Michigan.† (Those of the U. S. Signal Service in Italics.)	Divisions of the State.†	Degrees of Coloration of Test-paper—Night Observations.													
		Year.		Months, 1884.											
		Norm. ‡	1884.	Jan.	Feb.	Mar	Apr.	May	June	J'ly.	Aug.	Sept.	Oct.	Nov.	Dec.
Av. for 20 Stations......	....	......	3.11	3.98	4.30	2.73	3.09	3.28	2.70	2.62	2.62	2.42	2.74	2.80	3.07
Marquette..............	U. P.	2.60^{2}	2.20	3.23	3.33	2.65	2.83	2.52	1.50	1.68	1.81	1.87	1.42	1.83	1.71
Manistique	U. P.	......	4.20	5.20	4.78	4.68	3.30	4.16	4.97	2.74	4.52	3.77	[g]4.74	3.40	4.13
Escanaba	U. P.	3.12^{4}	3.60	3.18	5.09	3.72	3.20	2.90	3.87	2.65	3.32	4.20	3.55	3.20	4.26
Traverse City..........	N. W.	2.80^{3}	2.27	4.43	4.85	3.53	2.73	2.26	0.93	0.84	0.84	0.90	1.48	1.90	2.52
Mackinaw City..........	N.	......	3.10	3.67	3.19	2.33	2.37	3.23	2.97	2.52	3.06	3.10	3.68	3.30	3.80
Alpena..................	N. E.	3.49^{6}	4.52	3.53	6.02	3.72	3.60	4.94	3.57	4.35	4.71	4.83	4.77	4.82	5.42
Grand Haven...........	W.	3.73^{5}	3.33	3.69	3.81	3.78	3.18	4.27	3.55	3.45	3.08	2.40	3.15	[b]2.80	2.84
Reed City...............	W.	3.48^{6}	3.06	3.98	4.71	3.62	2.50	2.55	2.40	2.90	2.10	2.00	[a]2.90	3.33	[a]3.67
Port Austin....	B. & E.	3.84^{9}	3.77	[f]4.72	[d]4.73	4.98	3.63	3.81	3.23	2.71	[a]3.53	[b]2.83	[f]3.32	3.60	[c]4.14
Port Huron.............	B. & E.	2.85^{4}	2.99	4.11	2.81	3.36	3.10	3.39	2.53	2.68	2.81	2.80	3.23	2.53	2.48
Thornville..............	B. & E.	3.26^{8}	3.45	4.72	5.29	5.24	3.63	3.29	2.53	2.87	2.03	2.00	2.61	3.47	3.71
Ionia	C.	2.00^{9}	1.70	1.97	2.63	2.55	2.66	2.41	[b]1.72	1.67	1.29	0.46	1.09	1.06	0.90
Lansing...............††	C.	3.89^{6}	3.36	4.27	3.47	4.01	3.27	3.61	2.67	3.90	3.42	2.80	3.39	2.70	2.77
Lansing...............**	C.	......	3.90	4.83	5.28	5.07	4.07	4.71	3.80	3.90	3.42	2.80	3.39	2.70	2.77
Swartz Creek..........	C.	......	3.95	6.40	6.93	5.92	3.77	3.97	2.07	2.45	2.24	2.35	3.45	4.13	3.68
Ann Arbor..............	S. C.	2.49^{5}	2.68	[a]3.08	4.19	3.46	[e]3.77	3.21	[c]2.57	[a]2.20	[e]1.73	1.77	1.35	2.35	2.50
Battle Creek............	S. C.	2.41^{3}	2.14	2.36	3.29	2.75	2.73	2.74	2.43	2.03	2.32	1.89	0.65	0.53	1.90
Hillsdale	S. C.	3.50^{8}	3.52	[b]3.57	4.22	3.46	4.07	3.87	3.77	3.55	3.29	3.00	3.26	3.07	3.06
Kalamazoo..............	S. C.	3.12^{8}	2.80	3.94	4.74	3.98	2.17	2.19	2.00	2.10	2.29	2.00	2.10	2.87	3.16
Marshall	S. C.	3.23^{4}	3.19	5.04	4.36	3.40	3.03	3.29	2.47	3.58	2.97	2.73	2.32	2.60	2.52
Tecumseh................	S. C.	3.26^{8}	2.42	4.43	3.60	[b]3.47	2.20	2.94	2.20	1.58	[d]1.00	0.73	2.35	2.43	2.13

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[a], [b], [c] In the columns from January to December, inclusive, the letters [a], [b], [c], etc., stand directly above the numbers from which they refer to the notes below.

[a] For 30 days. [b] For 29 days. [c] For 28 days. [d] For 27 days. [e] For 26 days. [f] For 25 days. [g] For 23 days.

* At the U. S. Signal Service Stations for the year 1884, the observations were made at 7 A. M., 3 P. M., and 11 P. M., Washington mean time. The corresponding local time for each of these stations is stated in star (*) footnote to Table I., page 28.

† The names of observers, their places of observation, and the counties in which these places are situated, are stated in Exhibit 1, page 6. The full names of divisions, and the counties in each division are stated in Exhibit 1, in a paper which follows, on weekly reports of sickness.

‡ Numbers in this column state the average annual relative amount of ozone by night for periods of years ending in each case with Dec. 31, 1884. The small figures above and at the right of numbers which state the average, denote the number of years included in the average.

NOTE.—The computations were furnished by the observers at Escanaba and Grand Haven for the year; at Mackinaw City, Jan. to Oct. inclusive, and Dec.; at Ionia, Jan. to May, and July to Dec. inclusive; at Ann Arbor, Jan. to March and Oct. to Dec. inclusive. All other computations in Table IX. were made at the office of the State Board of Health.

†† ** See page 68 for (††) and (**) foot-notes.

Six lines in this table are graphically represented in Diagram IX., page 66.

†† AND ** FOOT-NOTE TO TABLE VIII., PAGE 65.

†† The following Exhibit, relates to the first line for Lansing in Table VIII., on page 65. Reasons and explanations are given in the text on pages 57-59.

	Degree of Coloration of Test-Paper.—Day Observation, (7 A. M. to 2 P. M.)												
	Av. for yr.	Jan.	Feb.	Mar.	Apr.	May.	Jun.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
Monthly averages in the first line for Lansing in Table VIII.	....	4.12[1]	2.83[1]	2.77[1]	2.63	2.90	2.30	2.94	3.03	2.83	2.52	2.23	2.29
Subtraction of 0.17 for difference in sensitiveness of test-paper..........................	....	0	0	0	.17	.17	.17	.17	.17	.17	.17	.17	.17
		4.12	2.83	2.77	2.46	2.73	2.13	2.77	2.86	2.66	2.35	2.06	2.12
Subtraction of 0.50 for difference in place of observation for last six months............	....	0	0	0	0	0	0	.50	.50	.50	.50	.50	.50
	2.41	4.12	2.83	2.77	2.46	2.73	2.13	2.27	2.36	2.16	1.85	1.56	1.62

[1] No subtraction of 0.17 is made from the averages for January, February and March in this foot-note, because it had been done in the table.

** The second line for Lansing in Table VIII. is a statement of the relative amount of ozone at Lansing as indicated by exposing test-paper in the southwest part of the Capitol yard, for the first six months on a post with a sheltered top, and for the last six months in a more enclosed shelter for meteorological instruments. By comparative observations for the month of July, more ozone was indicated in the instrument shelter than at the post. Exhibit G, page 61, shows the difference to have been 0.36 from 7 A. M. to 2 P. M.

†† AND ** FOOT-NOTE TO TABLE IX., PAGE 67.

†† The following exhibit relates to the first line for Lansing in Table IX., on page 67, Reasons and explanations are given in the text on pages 57-59.

	Degree of Coloration of Test-paper. Night Observation. (9 P. M. to 7 A. M.)												
	Av. for Year.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
Monthly averages for first line for Lansing in Table IX.............	......	4.27[1]	3.47[1]	4.01[1]	3.27	3.61	2.67	3.90	3.42	2.80	3.39	2.70	2.77
Subtraction of 0.12 for difference of sensitiveness of test-paper	......	0	0	0	.12	.12	.12	.12	.12	.12	.12	.12	.12
		4.27	3.47	4.01	3.15	3.49	2.55	3.78	3.30	2.68	3.27	2.58	2.65
Subtraction of 0.51 for difference in place of observation for last 6 months..............	......	0	0	0	0	0	0	.51	.51	.51	.51	.51	.51
	3.01	4.27	3.47	4.01	3.15	3.49	2.55	3.27	2.79	2.17	2.76	2.07	2.14

[1] No subtraction of 0.12 is made from the averages for January, February and March in this foot-note because it had been done in the table.

** The second line for Lansing in Table IX. is a statement of the relative amount of ozone at Lansing as indicated by exposing test-paper in the southwest part of the Capitol yard, for the first six months on a post with a sheltered top, and for the last six months in a more enclosed shelter for meteorological instruments. By comparative observations for the month of July, more ozone was indicated in the instrument shelter that at the post. Exhibit G, page 61, shows the difference to have been 0.06 from 9 P. M. to 7 A. M.

EXHIBIT 29.—*Average Velocity of the Wind in Miles per Hour, by Months, for the 5 Years, 1880-84, and comparisons of 1884 with this average and with the Year 1883. From Registers of the Robinson's Self-Registering Anemometer in the Office of the State Board of Health, State Capitol, Lansing, Michigan.*

Years, Etc.	Annual Av.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
Av. for 5 years, 1880-84.	10.1	11.0	11.5	11.4	11.7	10.4	8.9	8.6	7.4	8.7	9.0	11.5	10.9
1883.	11.0	12.2	13.1	11.6	11.5	11.9	9.7	10.3	8.0	8.1	9.4	14.4	12.0
1884.	9.7	11.2	7.0	8.4	11.8	10.9	7.2	9.1	8.4	9.4	10.2	10.8	12.2
In 1884 **Greater** than Av. 5 years, 1880-84.	......	.2	......	......	.1	.5	......	.5	......	.7	1.2	......	1.3
In 1884 **Less** than Av. 5 years, 1880-84	.4	......	4.5	3.0	......	......	1.7	......	1.0	......	......	.7	......
In 1884 **Greater** than in 1883	......	......	......	......	.3	......	......	......	.4	1.3	.8	......	.2
In 1884 **Less** than in 1883	1.3	1.0	6.1	3.2	......	1.0	2.5	1.2	......	......	......	3.6	......

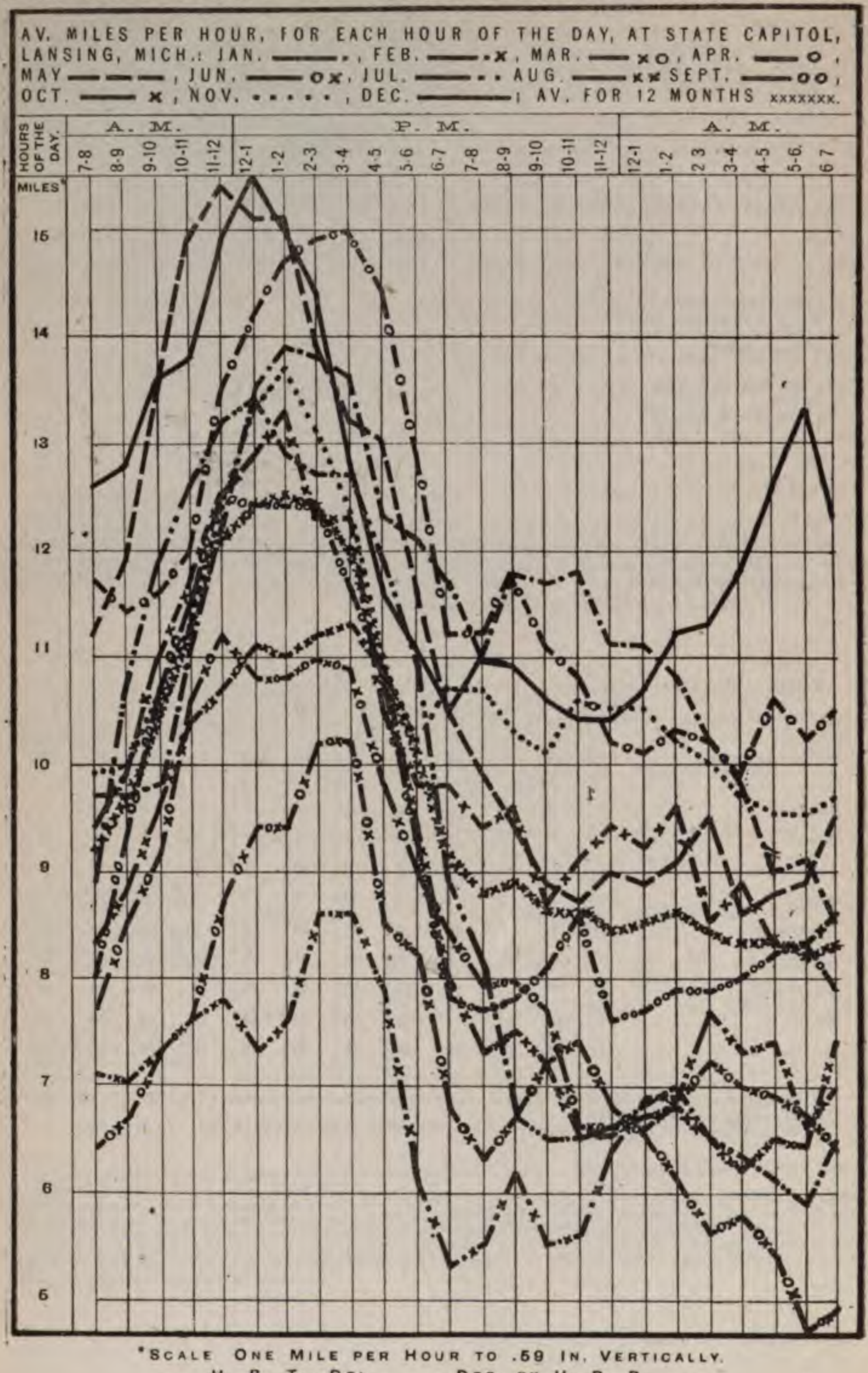
EXHIBIT 30.—DIRECTION OF WIND, 1878-84.—*Number of Observations per Month (at 7 A. M., 2 P. M., and 9 P. M.,* Daily), at which the Wind was Blowing from the several (eight) Points of Compass.—Annual and Monthly Averages for the Seven Years 1878-84, at Stations in Michigan.*†

Points of Compass.	Average Number of Observations per Month,—7 Years, 1878-84.												
	Annual Av.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
All Observations	91	93	85	93	90	93	90	93	93	90	92	90	93
Calm	5	4	4	4	4	5	6	7	8	6	5	4	4
North	7	6	6	9	9	8	7	7	7	6	6	5	5
Northeast	8	6	8	9	12	12	10	7	10	7	7	5	5
East	6	4	5	7	8	7	7	4	6	6	5	4	5
Southeast	9	9	9	10	9	10	10	7	8	9	10	8	7
South	10	11	10	7	7	10	11	9	10	13	14	12	10
Southwest	18	22	15	12	12	16	15	19	18	19	19	20	23
West	15	16	14	14	11	13	13	18	13	12	13	18	19
Northwest	14	13	13	19	17	12	10	13	12	12	13	14	14

* At stations of the U. S. Signal Service the observations were made at 7 A. M., 3 P. M., and 11 P. M., Washington mean time.

† At 12 stations in 1878; 16 in 1879; 19 in 1880; 19 in 1881; 21 in 1882; 19 in 1883, and 21 in 1884.

DIAGRAM X.—VELOCITY OF WIND, BY HOURS AND MONTHS, 1884.



*SCALE ONE MILE PER HOUR TO .59 IN. VERTICALLY.
H. B. T., DEL. DES. BY H. B. B.

TABLE X.—*Average velocity of the Wind, in Miles per Hour, for each Hour of the Day, by Months of the Year 1884.—Compiled from Registers of the Robinson's Self-Registering Anemometer, exposed above the roof of the Capitol, and registering in the office of the State Board of Health, Lansing, Michigan.*

Months.	Average.			Hours (1884), and Average Miles Per Hour.																							
	5 Years, 1880-84.	1883	1884.	A. M.					P. M.												A. M.						
				7-8	8-9	9-10	10-11	11-12	12-1	1-2	2-3	3-4	4-5	5-6	6-7	7-8	8-9	9-10	10-11	11-12	12-1	1-2	2-3	3-4	4-5	5-6	6-7
Year.......	10.1	11.0	9.8	9.2	9.7	10.5	11.3	12.1	12.4	12.5	12.4	12.0	11.0	10.1	9.1	8.8	8.9	8.6	8.6	8.4	8.5	8.6	8.4	8.3	8.3	8.2	8.3
January	11.0	12.2	11.2	9.7	9.7	9.8	11.1	12.2	13.5	13.9	13.8	13.6	12.3	12.1	11.7	11.0	11.8	11.7	11.8	11.1	11.1	10.8	10.2	9.8	9.0	9.1	8.5
February	11.5	13.1	7.0	7.1	7.0	7.3	7.6	7.8	7.3	7.6	8.6	8.6	7.9	6.1	5.3	5.5	6.2	5.5	5.6	6.4	6.9	6.9	7.7	7.3	7.4	6.6	7.0
March........	11.4	11.6	8.4	7.7	8.5	9.2	10.6	11.2	10.8	10.8	11.0	10.9	9.8	9.0	8.4	7.9	8.0	7.7	6.6	6.6	6.6	6.9	7.2	7.0	6.9	6.7	6.4
April.........	11.7	11.5	11.9	11.7	11.4	11.6	12.0	13.5	14.2	14.7	14.9	15.0	14.4	12.9	11.2	11.2	11.8	11.1	10.8	10.2	10.1	10.3	10.2	9.9	10.6	10.2	10.5
May..........	10.4	11.9	11.2	11.2	11.9	13.6	14.9	15.4	15.1	15.1	13.9	13.2	13.0	11.6	10.5	9.9	9.4	8.9	8.7	9.0	8.9	9.1	9.5	8.6	8.8	8.9	9.5
June..........	8.9	9.7	7.2	6.4	6.7	7.3	7.6	8.7	9.4	9.4	10.2	10.2	8.5	8.2	6.8	6.3	6.7	7.2	7.4	6.8	6.5	6.1	5.6	5.8	5.4	4.7	4.9
July..........	8.6	10.3	9.2	8.9	10.7	11.9	12.6	13.2	13.4	12.9	12.7	12.7	11.9	10.9	8.9	8.1	6.7	6.5	6.5	6.6	6.8	7.0	6.5	6.3	6.1	5.9	6.5
August	7.4	8.0	8.4	8.3	8.8	9.6	10.4	10.7	11.1	11.0	11.2	11.3	10.9	9.4	8.0	7.3	7.5	7.2	6.5	6.5	6.7	6.8	6.5	6.2	6.5	6.4	7.4
September ..	8.7	8.1	9.4	8.0	9.3	10.7	11.5	12.5	12.4	12.4	12.4	11.6	10.8	9.3	7.8	7.7	7.8	8.1	8.6	7.6	7.7	7.9	7.9	8.0	8.2	8.3	7.9
October......	9.0	9.4	10.1	9.4	9.9	11.0	11.7	12.5	12.9	13.3	12.3	12.3	10.5	9.8	9.8	9.4	9.6	8.7	9.1	9.4	9.2	9.6	8.5	8.9	8.3	8.3	8.6
November ..	11.5	14.4	10.8	9.9	10.0	10.7	11.3	12.4	13.3	13.7	13.1	12.3	10.9	10.2	10.7	10.7	10.3	10.1	10.6	10.5	10.5	10.2	10.0	9.7	9.5	9.5	9.7
December...	10.9	12.0	12.3	12.6	12.8	13.6	13.8	14.9	15.5	15.0	14.4	12.8	11.6	11.1	10.5	11.0	10.9	10.6	10.4	10.4	10.7	11.2	11.3	11.8	12.6	13.3	12.3

The statements in the third figure-column in Table X. of the average velocity of the wind in miles per hour, by months, during the year 1884, are graphically represented in Diagram XI., page 73. The remaining columns of Table X. for 1884 are graphically represented in Diagram X., page 70,

TABLE XI.—*Average Velocity of the Wind in Miles per Hour for the Year and for each Month of the Year 1884, at 9 Stations in Michigan. Computed from Registers of the Robinson's Self-Registering Anemometer,* by Observers for the State Board of Health and for the U. S. Signal Service.*

Stations in Michigan.†	Divisions of the State.	Miles, by Self-Registering Anemometer.													
		Year.		Months in 1884.											
		Norm. ‡	1884.	Jan.	Feb.	Mar.	Apr.	May.	June	July.	Aug.	Sept.	Oct.	Nov.	Dec.
Av. for 9 stations...	......	......	9.3	11.1	9.2	8.8	10.1	9.4	6.8	7.9	7.9	9.0	10.5	10.3	10.8
Marquette..........	U. P.	8.8^{8}	8.6	9.5	8.0	7.2	8.9	7.2	5.5	6.5	7.8	9.4	10.9	11.7	10.1
Escanaba	U. P.	8.8^{8}	9.0	9.5	9.3	7.7	10.2	9.4	8.0	7.9	7.8	8.7	10.8	9.4	9.0
Mackinaw City.....	N.	......	9.4	10.5	8.5	8.6	9.3	8.0	6.7	8.4	8.1	9.7	12.4	12.1	10.8
Alpena..........	N. E.	9.5^{3}	9.0	10.0	9.7	8.7	10.4	9.1	6.3	8.0	8.0	8.7	10.4	9.6	8.2
Grand Haven.......	W.	11.2^{3}	10.7	13.1	11.1	9.3	11.2	10.3	7.5	8.5	9.5	11.0	12.9	10.4	13.1
Port Huron.........	B. & E.	9.3^{8}	9.4	12.9	9.4	10.3	10.9	9.9	6.7	7.5	7.6	8.1	9.4	9.3	11.0
Lansing............	C.	10.1^{6}	9.7	11.2	7.0	8.4	11.8	10.9	7.2	9.1	8.4	9.4	10.2	10.8	12.2
Ann Arbor....	S. C.	9.3^{3}	9.0	12.4	9.8	9.9	10.7	10.2	5.7	7.3	6.3	7.3	8.0	9.1	10.9
Detroit............	S. E.	9.5^{8}	9.0	10.4	9.7	8.9	7.8	9.3	7.2	7.9	7.7	8.3	9.8	10.4	11.6

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* Gibbon's Anemometer was used at Ann Arbor.

† The names of observers, their places of observation, and the counties in which these places are situated, are stated in Exhibit 1, page 6.

‡ Numbers in this column state the average velocity of the wind in miles per hour for periods of years ending in each case with Dec. 31, 1884. The small figures above and at the right of numbers which state the average denote the number of years included in the average.

Graphic representations of statements made in Table XI. are given in Diagram XI., page 73.

TABLE XII.—*Number of Observations per Month (at 7 A. M., 2 P. M., and 9 P. M.,* daily), at which the Wind was Blowing from each of the Eight Principal Points of Compass, during the Year and during each month of the Year 1884.—Average for 21 Stations in Michigan.*†

Points of Compass.	Average Number of Observations Per Month, 1884.												
	Year.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
All observations.......	91	92	87	93	90	93	90	93	93	90	91	90	93
Calm..................	5	3	3	6	5	6	9	7	7	5	3	3	4
North..................	8	9	10	12	13	9	7	7	7	5	5	6	7
Northeast.............	8	6	11	12	14	10	15	6	7	4	5	4	5
East..................	5	1	7	7	9	5	10	5	4	5	3	3	5
Southeast.............	9	6	9	12	11	10	12	8	9	9	8	4	8
South.................	11	9	10	9	6	10	13	6	12	18	14	10	14
Southwest.............	17	26	9	12	5	14	13	14	18	24	25	21	22
West..................	14	19	14	10	9	14	6	20	14	10	13	19	16
Northwest.............	14	15	14	13	18	15	4	20	15	10	14	18	13

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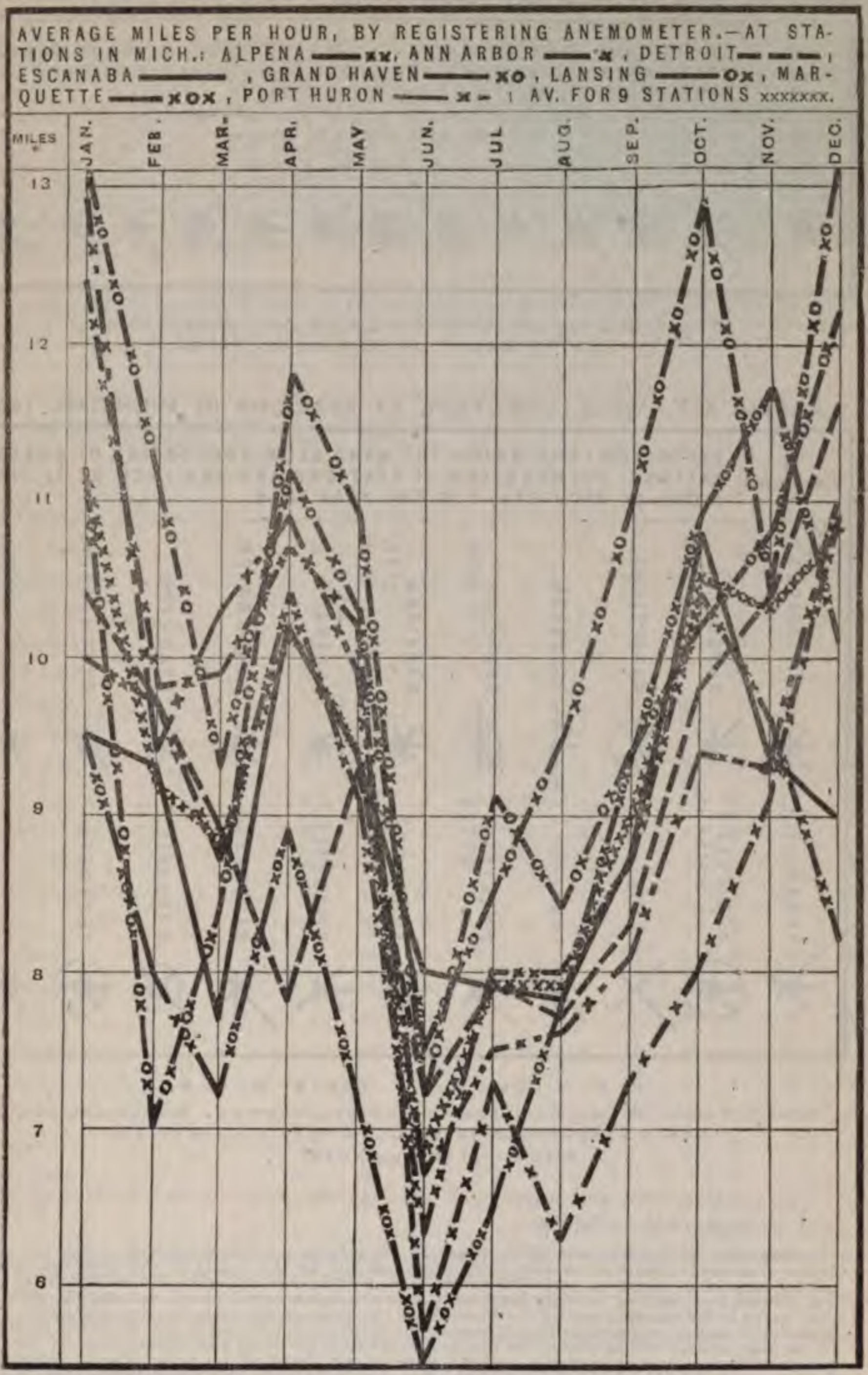
* At stations of the U. S. Signal Service the observations were made at 7 A. M., 3 P. M., and 11 P. M., Washington mean time.

† The names of observers, their places of observation, and the counties and divisions of the State in which those places are situated are stated in Exhibit 1, page 6.

Graphic representations of statements in Table XII. are given in Diagram *XIII., page 74.*

DIAGRAM XI.—VELOCITY OF WIND, BY MOS., IN 1884.

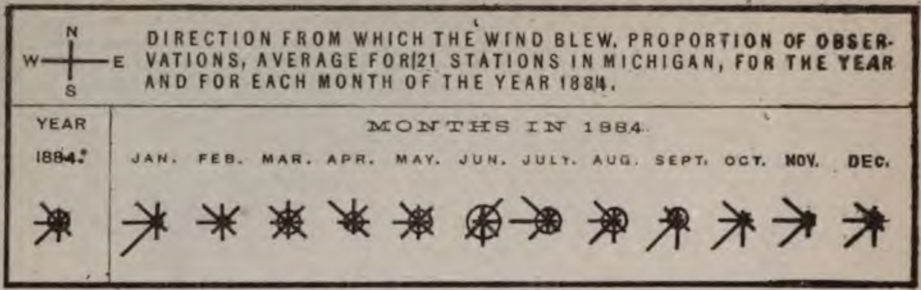


AVERAGE MILES PER HOUR, BY REGISTERING ANEMOMETER.—AT STATIONS IN MICH.: ALPENA ——xx, ANN ARBOR ——x, DETROIT— — —; ESCANABA ————, GRAND HAVEN——xo, LANSING ——ox, MARQUETTE ——xox, PORT HURON —— x — ; AV. FOR 9 STATIONS xxxxxxx.

*SCALE, ONE MILE PER HOUR TO .84 IN. VERTICALLY.

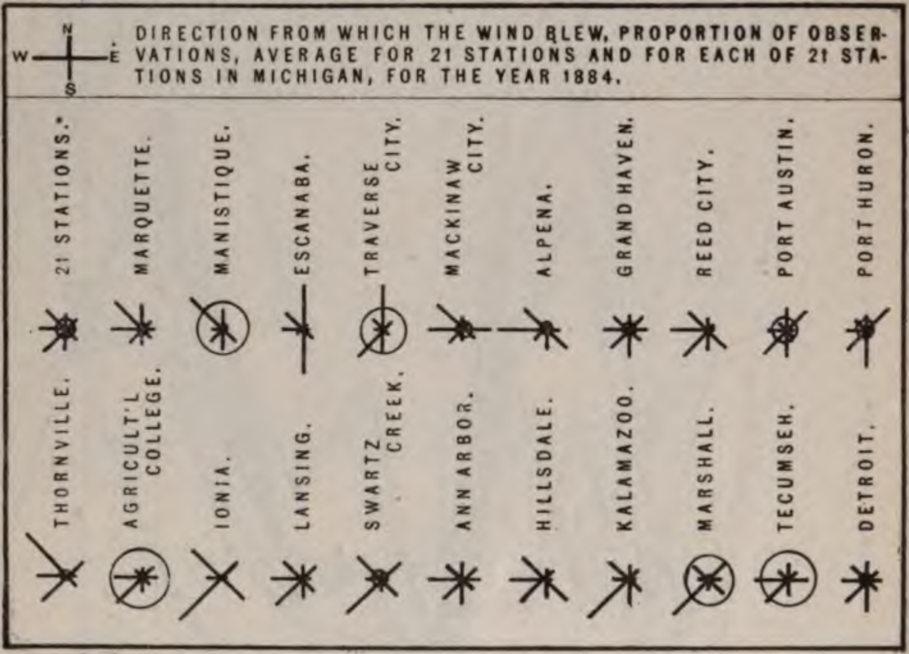
H. B. T., DEL.   DES. BY H. B. B.

DIAGRAM XIII.—WIND, DIRECTION, IN MICH., YEAR AND MONTHS, 1884.



*SCALE RADIUS .01 OF ONE INCH TO ONE OBSERVATION.
H. B. T., DEL. DES. BY H. B. B.

DIAGRAM XIV.—WIND, DIRECTION, AT STATIONS IN MICHIGAN, 1884.



H. B. T. DEL. DES. BY H. B. B.

*SCALE, RADIUS .01 OF ONE INCH TO ONE OBSERVATION. NUMERICAL STATEMENTS CORRESPONDING TO LINES IN THIS DIAGRAM ARE GIVEN IN TABLE XIII, PAGE 75.

The construction and purport of the diagrams relating to direction of wind may be explained as follows:

In diagrams XII., XIII., and XIV., pages 74, 76, relating to direction of the wind, the single figures or separate groups of lines are designed to indicate by the length of the lines the number and the proportion of regular observations at 7 A. M., 2 P. M., and 9 P. M.,* daily, at which the wind was blowing from each of the eight principal points of compass at the places and for the periods of time stated in the margin; and by the direction of the lines on the page, the direction of the wind. Each figure consists of lines drawn to a common center from some or all of the following directions on the page, and indicating that at the times of observation the wind blew from points of the compass as follows: Lines toward the common center from the top of the page indicate observations that the wind was blowing from the north; from the right-hand side, observations that the wind was from the east; from the bottom of the page, that it was from the south; from the left-hand side, that it was from the west; from the upper left-hand corner, that it was from the northwest: from the upper right-hand corner, that it was from the northeast; from the lower right-hand corner, that it was from the southeast; from the lower left-hand corner, that it was from the southwest. The number of regular observations at which the wind was blowing from the direction denoted by a line is indicated by the length of that line, .01 of an inch being the unit or the length of line for one observation. The circles indicate calms, the number of regular observations at which there was no wind being denoted by the length of the *radius* of the circle drawn about the point of convergence of the lines for a given place or period of time, the length for one observation being, as before, .01 of an inch. Thus, by Diagram XII, page 76, or by Table XIV, pages 77-80, it appears that at Thornville, in August, 1884, at 7 of the regular tri-daily observations for the month there was a calm; at 12 observations the wind was blowing from the west; at 34 from the northwest; at 12 from the northeast, etc. For convenient study, the top of these diagrams should be held toward the north. Definite numerical statements corresponding to these diagrams are given in Tables XII., XIII., and XIV., pages 72, 75 and 77-80.

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* At the Stations of the U. S. Signal Service the observations were made at 7 A. M., 3 P. M., and 11 P. M., Washington mean time.

TABLE XIII.—*Average Number of Observations per Month for the Year 1884, at which the Wind was Blowing from each of the Eight Principal Points of the Compass, at each of 22 Stations in Michigan; also the Average for 21 of said Stations.**

Stations in Michigan. (Those of the U. S. Signal Service in Italics.)	Divisions of the State.†	Average Number of Observations Per Month in 1884.									
		All Obs.	Calms	N.	N. E.	E.	S. E.	S.	S. W.	W.	N. W.
Av. for 21 Stations. ‡		91	5	8	8	6	9	11	17	14	14
Marquette	U. P.	92	3	13	6	7	7	9	10	17	20
Manistique	U. P.	90	14	10	2	2	11	12	10	7	21
Escanaba	U. P.	92	1	23	3	3	7	24	5	12	13
Traverse City	N. W.	92	12	22	7	2	5	13	19	5	8
Mackinaw City	N.	91	4	7	5	14	8	7	10	18	19
Alpena	N. E.	92	3	4	4	8	15	10	8	26	15
Grand Haven	W.	92	3	8	10	9	8	15	13	14	11
Reed City	W.	91	0	6	5	4	14	11	18	19	14
Port Austin	B. & E.	89	6	12	14	4	4	14	17	10	7
Port Huron	B. & E.	92	5	9	17	4	5	19	14	10	8
Thornville	B. & E.	92	3	1	11	6	8	2	17	14	30
Agricultural College	C.	92	16	5	9	7	6	9	18	15	6
Ionia	C.	91	0	1	11	3	15	1	32	9	21
Lansing	C.	92	1	5	9	4	10	11	21	17	14
Swartz Creek	S. C.	92	4	3	12	2	12	6	26	9	17
Ann Arbor	S. C.	91	0	9	8	9	8	13	15	18	12
Battle Creek	S. C.	92	13	2	11	7	11	8	10	22	8
Hillsdale	S. C.	91	0	5	6	3	15	10	17	20	17
Kalamazoo	S. C.	92	0	8	7	2	8	14	30	9	15
Marshall	S. C.	92	13	1	12	6	11	5	26	7	11
Tecumseh	S. C.	90	14	8	6	10	1	9	17	18	7
Detroit	S. E.	92	3	10	8	7	8	18	15	13	11

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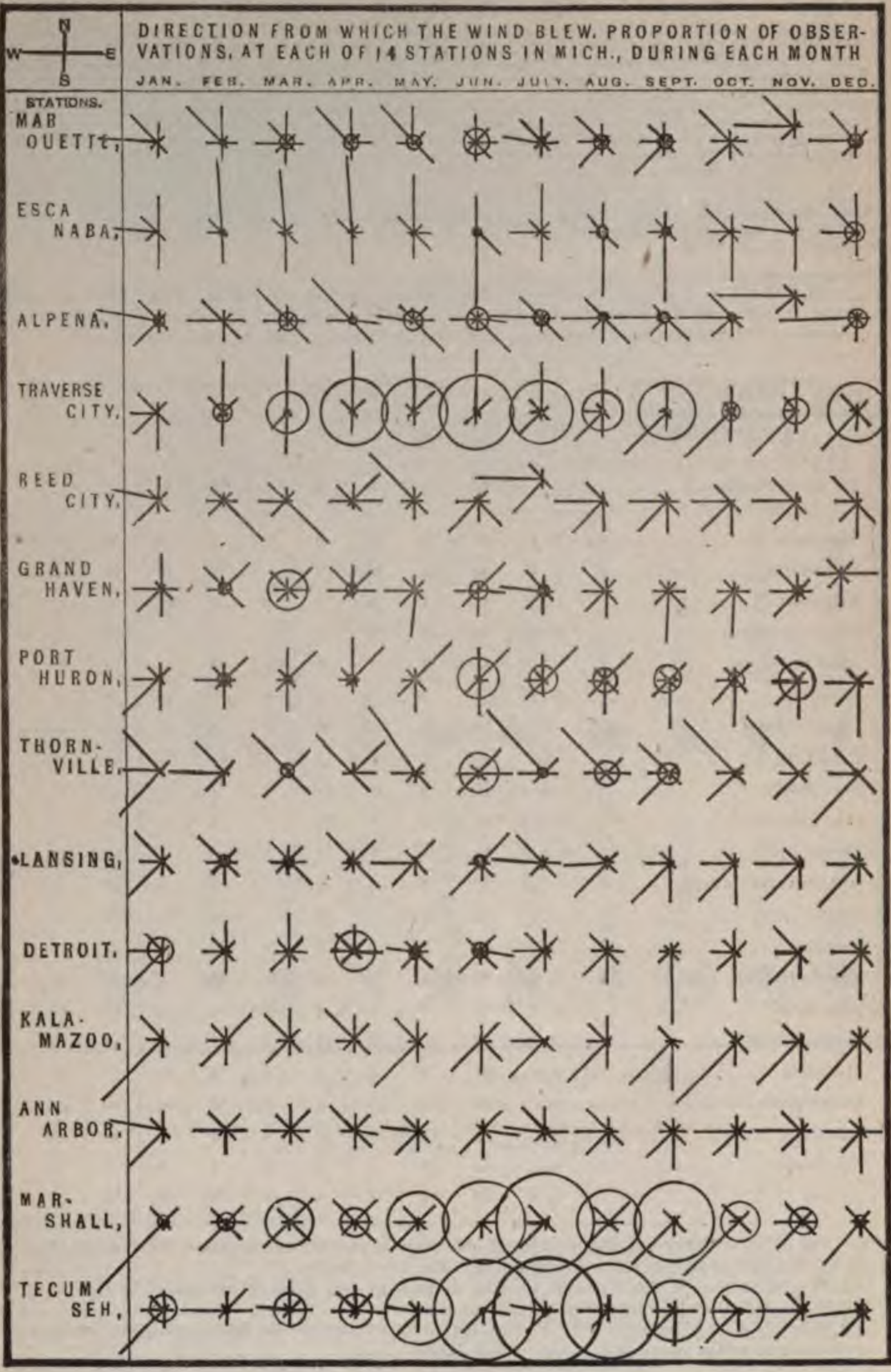
* The names of observers, their places of observation, and the counties and divisions of the State in which these places are situated are stated in Exhibit 1, page 6.

† The full names of the divisions, and the counties in each division, are stated in Exhibit 1, in a paper which follows on weekly reports of sickness.

‡ This line is an average for only the stations for which statements, nearly complete, are given for every month of the year. It does not include Battle Creek.

Graphic representations of statements in Table XIII. are given in Diagram XIV., page 74.

DIAGRAM XII. WIND, DIRECTION, AT STATIONS, BY MONTHS, IN 1884.



SCALE RADIUS .01 OF ONE INCH TO ONE OBSERVATION.
H. B. T., DEL. © DES. BY H. B. B.

TABLE XIV.—*Number of Observations for each Month of the Year 1884, at which the Wind was Blowing from each of the Eight Principal Points of Compass, at each of 22 Stations* in Michigan; also the average for 21 of the said Stations from which nearly Complete Observations were received for the Year. (Observations made at 7 A. M., 2 P. M., and 9 P. M., Daily.)*†

Stations in Michigan.* (Those of U. S. Signal Service in Italics.)	Divisions of the State.*	January.										February.										March.									
		Total.	Calm.	N.	N.E.	E.	S.E.	S.	S.W.	W.	N.W.	Total.	Calm.	N.	N.E.	E.	S.E.	S.	S.W.	W.	N.W.	Total.	Calm.	N.	N.E.	E.	S.E.	S.	S.W.	W.	N.W.
Av. for 21 Stations.‡	....	92	3	9	6	1	6	9	26	19	15	87	3	10	11	7	9	10	9	14	14	93	6	12	12	7	12	9	12	10	13
Marquette	U. P.	93	1	10	5	0	7	11	6	32	21	87	2	20	5	8	3	10	3	9	27	93	4	17	6	9	6	12	8	16	15
Manistique	U. P.	93	11	13	1	0	6	3	13	18	28	87	6	18	2	0	13	5	5	6	32	93	23	10	0	3	16	14	8	2	17
Escanaba	U. P.	93	0	20	0	0	5	23	8	24	13	87	1	38	1	1	4	19	3	8	12	93	0	34	5	4	9	22	4	5	10
Traverse City	N. W.	93	0	6	9	2	8	20	17	16	15	87	5	30	11	3	3	18	5	0	12	93	11	33	3	3	4	23	12	1	3
Mackinaw City	N.	93	1	10	6	6	6	8	9	31	16	87	3	4	10	21	3	4	6	16	20	93	12	4	6	15	11	3	12	17	13
Alpena	N. E.	93	3	5	5	0	6	6	19	34	15	87	1	6	6	11	14	11	1	21	16	93	5	8	4	8	20	3	7	13	25
Grand Haven	W.	93	1	19	3	9	8	14	18	16	5	87	4	8	22	5	15	3	5	9	16	93	11	6	18	12	8	7	9	8	14
Reed City	W.	93	0	14	6	0	9	8	21	26	9	87	0	4	5	7	32	5	12	11	11	93	0	7	6	3	33	1	13	16	14
Port Austin	B. & E.	76	0	11	7	0	5	13	19	11	10	87	9	18	12	10	0	13	7	9	9	93	10	12	23	4	6	13	21	2	2
Port Huron	B. & E.	93	1	9	9	2	4	17	26	15	10	87	4	8	17	5	5	16	7	16	9	93	2	17	23	3	6	17	10	6	9
Thornville	B. & E.	93	0	0	6	0	3	0	33	21	30	87	0	0	9	3	3	7	14	29	22	93	4	3	16	4	17	1	19	2	27
Agr'l College	C.	93	13	6	10	0	4	4	39	9	8	87	8	5	13	13	3	12	14	10	9	93	11	5	18	10	6	4	16	16	7
Ionia	C.	93	0	2	11	2	8	0	32	18	20	87	0	0	18	5	14	0	17	17	16	93	0	2	19	7	16	1	19	16	13
Lansing	C.	93	1	8	6	0	8	9	28	12	21	87	3	3	9	7	11	14	9	11	20	93	3	9	12	9	18	8	10	10	14
Swartz Creek	C.	93	3	6	10	0	6	2	39	13	14	87	1	2	18	6	10	13	12	13	12	93	7	8	14	4	15	9	13	6	17
Ann Arbor	S. C.	93	1	11	3	1	5	8	27	28	9	87	0	3	13	12	9	13	5	19	13	93	0	14	16	11	9	8	7	16	12
Battle Creek	S. C.	93	7	0	10	7	6	2	8	50	3	87	6	1	23	4	9	3	3	26	12	93	16	1	24	9	12	1	2	26	2
Hillsdale	S. C.	87	0	6	1	1	7	4	28	26	14	87	0	5	2	4	19	11	10	23	13	93	0	6	9	8	18	4	13	14	21
Kalamazoo	S. C.	93	0	5	0	0	5	10	47	9	17	87	0	6	19	2	4	14	20	11	11	93	0	17	8	3	9	9	19	8	20
Marshall	S. C.	93	3	2	11	2	5	4	53	2	11	87	5	1	13	10	12	6	21	8	11	93	13	0	19	8	15	4	20	4	10
Tecumseh	S. E.	92	7	10	3	5	0	10	35	12	10	87	2	10	16	14	0	10	7	25	3	89	9	18	9	15	1	8	6	19	4
Detroit	S. E.	93	7	6	4	1	2	14	26	20	13	87	2	16	8	4	8	14	11	14	10	93	1	20	11	10	8	11	15	8	9

Diagram XII., page 76 gives 14 lines in this table, and is explained on pages 74–75. Battle Creek is not included in the average line.

* For names of observers, etc., see Exhibit 1, page 6. For names of divisions, etc., see Exhibit 1, in a paper which follows, on weekly reports of sickness.

† With exceptions stated for U. S. Signal Service Stations in Table I, page 28.

‡ This line includes only the 21 stations from which statements complete, or nearly complete, were received for every month of the year; it does not include Battle Creek.

TABLE XIV.—CONTINUED.—*Direction of Wind, Months in 1884,—Observations at which the Wind was Blowing from Directions Named.*

Stations in Michigan.* (Those of U. S. Signal Service in Italics.)	Divisions of the State.*	April.										May.										June.									
		Total.	Calm.	N.	N. E.	E.	S. E.	S.	S. W.	W.	N. W.	Total.	Calm.	N.	N. E.	E.	S. E.	S.	S. W.	W.	N. W.	Total.	Calm.	N.	N. E.	E.	S. E.	S.	S. W.	W.	N. W.
Av. for 21 Stat'ns ‡	....	90	5	13	14	9	11	6	5	9	18	93	6	9	10	5	10	10	14	14	15	90	9	7	15	10	12	13	13	6	4
Marquette	U. P.	90	4	19	6	11	6	10	3	4	27	93	4	19	7	4	16	4	2	11	26	90	7	15	10	13	12	11	8	5	9
Manistique	U. P.	90	12	16	5	7	15	9	1	2	23	93	19	13	1	4	14	13	3	2	24	90	20	3	3	4	19	32	1	1	7
Escanaba	U. P.	90	0	41	6	5	4	19	1	3	11	93	0	31	5	8	12	15	4	5	13	90	2	20	2	5	18	41	1	0	1
Traverse City	N. W.	90	18	34	9	1	4	11	3	1	9	93	18	29	16	4	2	9	7	1	7	90	20	34	11	2	4	7	9	1	2
Mackinaw City	N.	90	5	12	4	18	11	1	3	19	17	93	9	6	12	15	16	2	5	17	11	90	9	4	4	25	9	4	3	16	16
Alpena	N. E.	90	2	5	4	14	18	0	1	14	32	93	5	6	10	12	24	1	4	20	11	90	6	5	4	16	26	7	5	16	5
Grand Haven	W.	90	4	13	14	13	2	5	8	14	17	93	0	9	7	6	7	26	12	18	8	90	5	4	21	14	2	15	13	15	1
Reed City	W.	90	0	10	21	15	9	5	4	14	12	93	0	7	6	5	11	11	9	9	35	90	0	4	7	7	19	12	27	12	2
Port Austin	B. & E.	90	5	24	25	8	6	4	4	6	8	93	9	16	10	3	8	20	11	10	6	90	15	1	32	7	3	11	12	7	2
Port Huron	B. & E.	90	3	23	25	5	5	8	5	7	9	93	1	7	28	1	9	19	13	8	7	90	11	17	24	5	2	20	9	1	1
Thornville	B. & E.	90	0	5	25	12	13	0	0	7	28	93	0	1	6	5	12	5	7	14	43	90	11	3	17	17	5	3	16	12	6
Agr'l College	C.	90	10	8	11	14	9	6	3	20	9	93	12	4	13	7	3	5	19	25	5	90	24	6	14	10	6	14	6	8	2
Ionia	C.	90	0	1	16	11	15	1	10	6	21	93	0	1	11	1	14	0	35	14	17	90	0	2	23	3	21	2	26	9	4
Lansing	C.	90	2	5	17	4	20	5	8	7	22	93	1	3	16	2	9	9	18	26	9	90	4	2	22	5	11	10	25	6	5
Swartz Creek	S. C.	90	3	4	24	3	16	4	6	3	27	93	2	3	14	0	13	6	22	12	21	90	7	0	20	8	16	8	24	5	2
Ann Arbor	S. C.	90	0	9	12	13	14	11	3	9	19	93	0	7	8	5	9	11	19	22	12	89	0	7	15	21	6	16	19	1	4
Battle Creek	S. C.	90	17	2	21	13	12	1	4	16	4	93	18	2	7	0	5	11	11	20	19	90	8	3	13	14	16	14	11	10	1
Hillsdale	S. C.	90	0	8	11	3	23	2	7	11	25	93	0	5	5	2	14	8	21	20	18	90	0	2	17	8	27	11	15	5	5
Kalamazoo	S. C.	90	0	14	13	2	11	7	9	11	23	93	0	11	6	1	5	13	34	6	17	90	0	8	14	6	16	18	24	2	2
Marshall	S. C.	90	8	0	18	9	16	4	10	8	17	93	16	1	13	5	7	5	22	13	11	90	22	1	20	9	8	9	18	2	1
Tecumseh	S. E.	90	9	14	13	16	3	4	4	13	14	93	18	5	2	14	0	11	18	18	7	89	27	3	13	15	1	8	17	3	2
Detroit	....	90	11	17	9	15	6	1	9	8	14	93	3	5	8	7	12	21	12	16	9	90	4	8	17	18	13	13	2	5	10

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*, †, ‡. For these references see foot-notes to this table on page 77. Battle Creek is not included in the average line.
NOTE.—Graphic representations of statements for 14 lines in this table are given in Diagram XII, page 76, which is explained on pages 74-75.

TABLE XIV.—CONTINUED.—*Direction of Wind, Months in 1884.—Observations at which the Wind was Blowing from Directions Named.*

Stations in Michigan.* (Those of U. S. Signal Service in Italics.)	Divisions of the State.*	July.										August.										September.									
		Total.	Calm.	N.	N. E.	E.	S. E.	S.	S. W.	W.	N. W.	Total.	Calm.	N.	N. E.	E.	S. E.	S.	S. W.	W.	N. W.	Total.	Calm.	N.	N. E.	E.	S. E.	S.	S. W.	W.	N. W.
Av. for 21 stations‡	....	93	7	7	6	5	8	6	14	20	20	93	7	7	7	4	9	12	18	14	15	90	5	5	4	5	9	18	24	10	10
Marquette	U. P.	93	2	13	6	11	8	7	5	22	19	93	6	10	3	5	10	7	19	13	20	90	4	9	4	6	7	8	25	15	12
Manistique	U. P.	93	21	2	3	1	11	13	6	9	27	93	18	6	1	2	13	18	13	4	18	90	7	6	1	1	9	13	31	7	15
Escanaba	U. P.	93	0	27	7	3	7	16	5	18	10	93	4	15	1	0	12	36	5	8	12	90	3	10	5	3	8	38	5	10	8
Traverse City	N. W.	95	17	27	5	0	6	5	18	6	9	93	11	23	1	0	5	14	23	10	6	90	15	16	1	1	5	11	33	5	3
Mackinaw City	N.	92	6	3	4	9	7	3	11	24	25	93	6	7	1	8	10	9	16	14	22	90	2	2	2	16	8	15	16	15	14
Alpena	N. E.	93	4	3	4	7	17	7	5	29	17	93	3	1	4	3	22	14	8	23	15	90	3	3	1	4	17	12	12	28	10
Grand Haven	W.	93	3	8	4	6	6	13	14	24	15	93	2	7	9	4	10	15	15	13	18	90	0	5	5	9	13	29	11	10	8
Reed City	W.	93	0	6	1	2	6	5	24	38	11	93	0	4	1	1	5	17	24	27	14	90	0	4	1	6	11	19	23	20	6
Port Austin	B. & E.	93	8	13	18	4	2	8	8	21	11	90	11	4	16	0	3	19	15	13	9	90	2	9	5	1	7	25	26	10	5
Port Huron	B. & E.	93	8	12	26	2	4	9	14	10	8	93	7	6	21	2	10	18	12	9	8	90	8	2	13	5	7	29	13	6	7
Thornville	B. & E.	93	3	0	11	7	4	0	7	14	47	93	7	1	12	13	6	1	7	12	34	90	6	0	6	5	8	3	25	12	25
Agr'l College	C.	93	17	4	2	9	5	3	13	34	6	93	28	6	7	3	6	4	20	15	4	90	18	4	4	3	11	18	16	9	7
Ionia	C.	93	0	0	3	1	16	0	29	6	38	93	0	1	7	1	13	1	32	9	29	90	0	1	3	0	25	0	43	2	16
Lansing	C.	93	1	4	3	10	12	3	11	28	21	93	1	4	9	4	8	3	27	23	14	90	0	9	2	1	4	21	31	14	8
Swartz Creek	S. C.	93	2	0	5	2	14	2	17	14	37	93	7	6	11	0	11	4	26	10	18	90	5	2	10	0	12	10	42	2	7
Ann Arbor	S. C.	93	0	13	2	12	9	6	9	24	18	93	0	8	3	6	13	9	18	19	17	90	0	9	6	8	10	21	21	8	7
Battle Creek	S. C.	93	0	1	4	9	6	7	5	43	18	93	0	4	10	6	13	15	4	35	6	90	1	2	1	9	20	23	11	20	3
Hillsdale	S. C.	93	0	0	1	0	15	3	12	30	32	93	0	11	8	0	13	8	17	19	17	90	0	3	3	1	10	20	27	13	13
Kalamazoo	S. C.	93	0	2	4	0	9	4	28	19	27	93	0	14	4	1	3	15	31	11	14	90	1	1	1	5	6	27	33	5	11
Marshall	S. C.	93	26	2	5	3	8	5	20	11	13	93	17	0	16	9	8	3	19	10	11	90	21	2	4	2	10	8	32	1	10
Tecumseh	S. C.	91	29	5	1	7	1	2	16	21	9	87	25	9	2	10	0	7	13	17	4	90	16	6	0	12	0	19	20	12	5
Detroit	S. E.	93	2	12	11	4	5	11	15	18	15	93	0	7	5	10	10	20	19	9	13	90	0	5	7	6	9	40	9	8	6

*, †, ‡. For these references see foot-notes to this table on page 77. Battle Creek is not included in average line.
NOTE.—Graphic representations of statements for 14 lines in this table are given in Diagram XII, page 76, which is explained on pages 74-75.

TABLE XIV.—CONCLUDED.—*Direction of Wind, Months in 1884.—Observations at which the Wind was blowing from Directions Named.*

Stations in Michigan.* (Those of the U. S. Signal Service in Italics.)	Divisions of the State.*	October.										November.										December.									
		Total.	Calm.	N.	N. E.	E.	S. E.	S.	S. W.	W.	N.W.	Total.	Calm.	N.	N. E.	E.	S. E.	S.	S. W.	W.	N.W.	Total.	Calm.	N.	N. E.	E.	S. E.	S.	S. W.	W.	N.W.
Av. for 21 Stations‡	....	91	3	5	5	3	8	14	25	13	14	90	3	6	4	3	4	10	21	19	18	93	4	7	5	5	8	14	22	16	13
Marquette	U. P.	93	1	6	5	7	9	9	20	12	24	90	0	9	2	4	1	7	10	33	24	93	4	9	9	2	2	9	10	27	21
Manistique	U. P.	72	6	8	5	0	8	9	18	8	10	90	18	6	1	2	3	11	10	12	27	93	12	18	4	0	4	5	9	15	26
Escanaba	U. P.	93	0	9	3	5	6	28	10	13	19	90	0	9	3	0	1	21	3	29	24	93	6	21	1	1	3	13	8	19	21
Traverse City	N. W.	93	5	13	5	1	5	17	36	4	7	90	7	16	1	2	1	11	34	8	10	93	16	4	8	0	10	11	28	4	12
Mackinaw City	N.	93	0	4	4	8	5	13	17	15	27	90	0	12	3	8	4	10	11	18	24	93	0	15	6	14	6	9	12	13	18
Alpena	N. E.	93	3	2	2	5	8	11	15	29	18	90	0	3	0	5	6	10	14	43	9	93	5	3	3	6	5	12	10	44	5
Grand Haven	W.	93	1	6	4	9	11	26	17	11	8	90	3	9	9	7	6	8	18	15	15	93	2	3	9	19	7	18	11	13	11
Reed City	W.	90	0	1	1	1	8	19	25	22	13	90	0	4	4	3	9	10	17	25	18	89	0	7	3	2	14	20	13	11	19
Port Austin	B. & E.	78	2	12	11	3	4	11	23	9	3	90	3	14	4	1	3	14	23	16	12	93	0	10	6	1	2	21	34	10	9
Port Huron	B. & E.	93	5	6	11	2	9	25	17	10	8	90	10	2	4	4	0	20	18	15	17	93	1	1	6	8	3	29	19	18	8
Thornville	B. & E.	93	2	1	6	4	8	0	21	11	40	90	0	1	7	3	6	0	20	11	42	93	2	0	5	0	14	0	36	17	19
Agr'l College	C.	93	16	5	5	3	9	10	26	5	4	90	18	4	6	3	4	11	21	13	10	93	16	4	5	7	8	13	25	11	4
Ionia	C.	93	0	0	6	1	12	1	45	3	25	89	0	0	10	0	10	0	35	6	28	93	0	0	8	5	11	0	47	3	19
Lansing	C.	93	0	5	3	0	3	24	30	19	9	90	0	5	2	2	2	14	28	26	11	93	1	6	3	4	10	11	32	18	8
Swartz Creek	S. C.	93	5	1	8	1	10	5	36	11	16	90	4	2	8	3	5	5	39	6	18	93	3	3	5	2	13	5	39	11	12
Ann Arbor	S. C.	93	0	9	7	8	8	14	20	23	4	90	0	7	6	5	1	13	16	26	16	93	0	7	3	11	5	23	15	21	8
Battle Creek	S. C.	93	46	1	5	0	7	6	16	6	6	90	32	2	5	0	10	4	15	14	8	93	3	4	11	8	16	9	28	3	11
Hillsdale	S. C.	93	0	4	3	2	14	16	16	25	13	90	0	3	3	1	7	9	16	29	22	93	0	5	4	0	15	18	19	20	12
Kalamazoo	S. C.	93	0	4	4	0	9	14	47	4	11	90	0	5	3	1	7	16	34	10	14	93	0	8	5	2	9	20	36	6	7
Marshall	S. C.	93	11	3	9	3	9	0	42	4	12	90	7	2	7	8	10	3	24	15	14	93	3	0	8	5	20	9	31	6	11
Tecumseh	S. C.	90	14	3	1	7	2	11	25	16	11	89	3	10	5	3	1	6	22	26	13	93	4	7	2	5	6	13	20	30	6
Detroit	S. E.	93	1	11	8	2	4	29	15	14	9	90	0	3	5	2	7	15	24	14	20	93	0	7	5	4	10	27	17	16	7

*,†,‡ For these references see foot-notes to this Table on page 77. Battle Creek is not included in average line.
NOTE.—Graphic representations of statements for 14 lines in this table are given in Diagram XII., page 76, which is explained on pages 74-75.

DIAGRAMS RELATING TO METEOROLOGICAL CONDITIONS.

Most of the diagrams in this paper are to be read by tracing each irregular line across the diagram from left to right, and noting at what point it intersects each of the perpendicular lines having the name of a month at the top. What station is represented by the irregular line may be learned from the head of the diagram. The degree of value denoted by the intersection may be learned by referring to the figures in the left-hand column. Thus in Diagram I., page 29, relating to average temperature in 1884, tracing the line—×o×, representing Marquette, it may be seen that the average temperature at Marquette was, in January, about 11°, in February 10°, in April about 35°, in July about 60°, in October about 47°, etc. Definite numerical statements of the average temperature for each month at each station may be found in Table I., page 28, and accompanying each diagram is a table giving exact numerical statements for the conditions represented. The average line given in each table is in the corresponding diagram represented by an × line thus××××××. The lines in the diagrams give more ready general comparisons of stations with each other, or of months with each other, than is possible from the mere numerical statements. By Diagram II., page 34, it appears at a glance that the average daily range of temperature at Marshall, in 1884, was, during September, slightly higher than at any other of the eight stations represented in that diagram, and during December was considerably lower at Thornville. The marked agreement in the course of the lines in Diagram I., page 29, representing mean monthly temperature at six stations, and also that the agreement is closer in the last four months of the year than in earlier months, appear at once on reference to the diagram. The resemblance between the lines in Diagram I., p. 29, relating to mean temperature by months in 1884, and those in Diagram III., page 37, relating to absolute humidity of the atmosphere for the same periods, is apparent. By Diagram X., page 70, it appears that in every month of the year the highest velocity of the wind (on an average for the month) is reached between 12 M. and 3 P. M., and that the lowest velocity occurs in the latter part of the night or in early morning, and that in 1884, at Lansing, the months of most wind were May and December. By reference to Diagram XI., page 73, it may be seen that at other stations in Michigan where records of actual miles of wind traveled were kept, January, April, October, and December were, in 1884, the months of greatest wind. These statements illustrate the reading of the diagrams for any use it may be desired to make of the tables and diagrams. The three diagrams relating to direction of wind are differently constructed, and the manner of reading them is explained on pages 74 and 75 of this article.

EXHIBIT 31.—*Average Atmospheric Pressure, by Year and Months, in 1884, compared with Annual and Monthly average for 1883, and for the eight years, 1877–84. These Averages are for Groups of several Stations in Michigan.**

Years, Etc.	Average Atmospheric Pressure,—Inches of Mercury.												
	Annual Av.	Jan.	Feb.	Mar.	April.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
Av. for 8 yrs,—1877–84*	29.154	29.206	29.198	29.140	29.102	29.128	29.090	29.106	29.152	29.181	29.193	29.187	29.177
1883—(17 stations)*	29.189	29.221	29.328	29.145	29.125	29.099	29.072	29.140	29.233	29.238	29.275	29.182	29.205
1884- (18 stations)*	29.205	29.274	29.204	29.202	29.147	29.131	29.273	29.100	29.216	29.210	29.268	29.213	29.229
In 1884 **Greater** than Av. for 7 years,—1877–84	.051	.068	.006	.062	.045	.003	.183	......	.064	.029	.075	.026	.052
In 1884 **Less** than Av. for 7 yrs., 1877–84	......	......	......	......	......	......	......	.006	......	......	......	......	......
In 1884 **Greater** than in 1883	.016	.053	......	.057	.022	.032	.201	......	......	......	......	.031	.024
In 1884 **Less** than in 1883	......	......	.124	......	......	......	......	.040	.017	.028	.007	......	......

* Kalamazoo for the 6 years 1877-82; Battle Creek for 1877, 1880 and for 1882; Detroit for the 7 years 1878–84; Woodmere Cemetery (near Detroit) for the 3 years 1877-79; Mendon for 1877, 1878 and the 3 years 1881-83; Marquette, Alpena, Grand Haven, Port Huron and Lansing for the 6 years 1879-84; Benton Harbor for 1877 and 1878; Ypsilanti for 1877 and 1879; Agricultural College for 1877 and for the 4 years 1881-84; Otisville for 1878, 1880 and 1882; Tecumseh for 1879, 1880 and for the 3 years 1882-84; Washington for 1879, 1880, 1882 and 1883; Nirvana for 1879 and in 1880 to April 25, inclusive; Reed City, 1880 after April 25, and for the 4 years 1881-84; Thornville for 1880, 1881 and 1884; Escanaba for 1880 and for the 3 years 1882-84; Ann Arbor for 1881-84; Traverse City for 1882-84; Harrisville and Hastings for 1882; Hillsdale for 1882 and 1883; Port Austin and Marshall for 1883 and 1884; Manistique, Mackinaw City and Ionia for 1884.

EXHIBIT 32.—*Comparison of the Average Atmospheric Pressure during the Year and during each Month of the Year 1884, with Averages for the nine Years, 1875–83, and for the Year 1883. Corrected for Temperature and for Instrumental Error. Observations made at 7 A. M., 2 P. M. and 9 P. M., Daily, by Prof. R. C. Kedzie, at the State Agricultural College, near Lansing, Michigan.*

Years, Etc.	Average Atmospheric Pressure.—Inches of Mercury.												
	Annual Av.	Jan.	Feb.	Mar.	April.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
Av. 9 yrs, 1875–83	29.054	29.075	29.065	28.995	29.003	29.047	29.000	29.054	29.065	29.102	29.081	29.082	29.076
1883	29.094	29.116	29.239	29.046	29.029	28.994	28.985	29.059	29.141	29.149	29.145	29.115	29.111
1884	29.087	29.118	29.081	29.071	29.011	28.995	29.256	29.004	29.120	29.118	29.028	29.111	29.127
In 1884 **Greater** than Av. for 1875–83	.033	.043	.016	.076	.008	......	.256	......	.055	.016	......	.029	.051
In 1884 **Less** than Av. for 1875–83	......	......	......	......	......	.052	......	.050	......	......	.053	......	......
In 1884 **Greater** than in 1883	......	.002	......	.025	......	.001	.271	......	......	......	......	......	.016
In 1884 **Less** than in 1883	.007	......	.158	......	.018	......	......	.055	.021	.031	.117	.004	......

TABLE XV.—*Average Daily Range of Atmospheric Pressure* (*as determined from three daily observations**), *for the Year 1884, for 19 and at each of 19 Stations in Michigan.—Stations arranged in order by Latitude, those farthest North first.*

Stations in Michigan.† (Those of the U.S. Signal Service in italics.)	Divisions of the State.‡	Norm. §	Average Daily Range of Barometer.—Year and Months, 1884.													
			1883.	1884.	Jan.	Feb.	Mar.	April	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
Av. 19 stat'ns..	....	......	.180	.213	.304	.233	.276	.204	.176	.115	.125	.153	.106	.200	.231	.279
Av. 18 stat'ns.¶	....	......	.179	.215	.307	.232	2.77	.205	.177	.116	.127	.154	.103	.203	.232	.281
Marquette......	U. P.	.233^{3}	.240	.234	.335	.287	.265	.193	.166	.120	.142	.192	.283	.300	.243	.281
Manistique....	U. P.	......	.....	.229	.327	.294	.263	.199	.173	.120	.141	.179	.273	.257	.248	.276
Escanaba......	U. P.	.231^{3}	.240	.229	.322	.283	.272	.209	.172	.120	.135	.177	.267	.253	.244	.289
Traverse City..	N. W.	.225^{3}	.236	.222	.314	.290	.272	.214	.182	.113	.127	.170	.235	.220	.241	.283
Mackinaw City	N.	......	.....	.233	.331	.295	.280	.200	.174	.129	.150	.168	.264	.249	.255	.302
Alpena........	N. E.	.234^{2}	.241	.226	.327	.294	.277	.198	.170	.118	.136	.170	.234	.233	.249	.309
Grand Haven..	W.	.211^{3}	.224	.204	.312	.272	.282	.206	.181	.101	.105	.141	.192	.173	.219	.262
Reed City......	W.	.219^{3}	.229	.213	.304	.261	.263	.217	.180	.153	.123	.155	.214	.180	.225	.283
Port Austin...	B. & E.	.232^{2}	.241	.222	.252	.315	.311	.213	.170	.124	.139	.159	.231	.204	.219	.329
Port Huron....	B. & E.	.216^{2}	.223	.209	.305	.290	.271	.203	.174	.102	.120	.141	.188	.191	.220	.297
Thornville......	B. & E.	......	.....	.210	.310	.293	.277	.197	.191	.103	.129	.145	.199	.189	.224	.261
Agr'l College..	C.	.207^{2}	.214	.200	.282	.283	.268	.200	.165	.102	.113	.147	.180	.178	.226	.257
Ionia...........	C.	......	.....	.209	.299	.298	.281	.206	.175	.108	.114	.143	.194	.175	.233	.286
Lansing.........	C.	.211^{3}	.225	.206	.303	.293	.276	.200	.178	.100	.116	.139	.193	.172	.232	.266
Ann Arbor....	S. C.	.209^{3}	.222	.210	.305	.292	.293	.207	.182	.133	.134	.128	.173	.181	.221	.273
Hillsdale......	S. C.	.188^{3}	.208	.180	.243	.248	.261	.188	.154	.094	.106	.118	.160	.146	.206	.240
Marshall......	S. C.	.218^{2}	.229	.207	.300	.275	.278	.233	.181	.116	.114	.141	.182	.170	.236	.259
Tecumseh......	S. C.	.209^{3}	.229	.200	.295	.278	.272	.199	.181	.110	.114	.149	.174	.153	.220	.250
Detroit.........	S. E.	.217^{2}	.224	.210	.305	.290	.288	.198	.187	.113	.126	.136	.181	.184	.221	.295

* At stations of the U. S. Signal Service the observations were made at 7 A. M., 3 P. M., and 11 P.M., Washington mean time. The corresponding local time for each of these stations is stated in the star (*) footnote to Table I, page 28.

† The names of observers, their places of observation, and the counties in which these places are situated, are stated in Exhibit 1, page 6. The average atmospheric pressure at each of these stations, by months, in 1884, is given in Table XVII., page 84.

‡ The names of divisions, and the counties in each are stated in Exhibit 1, in a paper which follows, on weekly reports of sickness.

§ Numbers in this column state the average daily range of atmospheric pressure for periods of years ending in each case with Dec. 31, 1884. The small figures above and at the right of numbers which state the average daily range, denote the number of years included in the average.

¶ Not including Hillsdale.

NOTE.—The latitude and elevation of some of these stations are stated in Exhibit 2, page 7.

TABLE XVII.—*Average Atmospheric Pressure for the Year, and for each Month in the Year 1884, at each of 20 Stations in Michigan, and also the Average for 18 of the same Stations, as indicated by the Height, in inches, of Mercury in the Barometer. Corrected for Temperature,—Reduced to 32° F., (for some Stations not corrected for Instrumental Errors*).—Average of Observations made Daily at 7 A. M., 2 P. M., and 9 P. M.,† by Observers‡ for the State Board of Health and for the U. S. Signal Service.*

STATIONS IN MICHIGAN.‡ (Those of the U. S. Signal Service in italics.)	Divisions of the State.‡	Inches of Mercury.—Atmospheric Pressure.													
		Years.		Months, 1884.											
		Norm.§	1884.	Jan.	Feb.	March.	April.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
Average for 18 stations ‖	....	....	29.205	29.274	29.204	29.202	29.147	29.131	29.273	29.100	29.216	29.210	29.268	29.213	29.229
*Marquette**	U. P.	29.261 ^{12}	29.270	29.323	29.316	29.287	29.291	29.218	29.337	29.169	29.248	29.208	29.288	29.266	29.293
Manistique	U. P.	....	29.327	29.372	29.356	29.335	29.288	29.253	29.398	29.210	29.327	29.300	[g]29.384	29.335	29.363
*Escanaba**	U. P.	29.333 ^{3}	29.319	29.390	29.371	29.342	29.307	29.244	29.379	29.207	29.302	29.274	29.348	29.322	29.343
Traverse City	N. W.	29.354 ^{3}	29.341	29.379	29.361	29.352	29.309	29.260	29.407	29.235	29.347	29.329	29.401	29.351	29.360
*Mackinaw City**	N.	....	29.339	29.374	29.366	29.369	29.321	29.268	29.426	29.228	29.337	29.319	29.381	29.327	29.348
*Alpena**	N. E.	29.362 ^{12}	29.323	29.359	29.346	29.352	29.300	29.252	29.420	29.214	29.317	29.316	29.368	29.302	29.327
*Grand Haven**	W.	29.342 ^{12}	29.341	29.405	29.325	29.329	29.279	29.261	29.385	29.245	29.362	29.350	29.418	29.367	29.369
Reed City	W.	28.908 ^{6}	28.869	28.894	28.846	28.845	28.790	28.903	28.946	28.769	28.892	28.887	[e]28.937	28.873	[h]28.842
Port Austin	B. & E.	....	29.363	[b]29.476	29.368	29.372	29.306	29.272	29.406	29.241	29.369	[b]29.353	[f]29.451	29.381	29.364
*Port Huron**	B. & E.	29.327 ^{6}	29.301	29.345	29.284	29.291	29.223	29.213	29.366	29.192	29.317	29.334	29.391	29.312	29.350
Thornville	B. & E.	28.970 ^{5}	28.970	29.305	28.910	28.926	28.865	28.858	29.013	28.841	28.975	28.983	29.040	28.952	28.969
Agricultural College*	C.	29.096 ^{3}	29.087	29.118	29.081	29.071	29.011	28.995	29.256	29.004	29.120	29.118	29.028	29.111	29.127
Ionia	C.	....	29.294	29.358	29.288	29.292	29.220	29.205	29.341	29.178	29.303	29.309	29.373	29.312	29.349
Lansing	C.	29.036 ^{6}	29.037	29.099	29.019	29.020	28.964	28.966	29.103	28.951	29.075	29.041	29.122	29.039	29.044
Ann Arbor	S. C.	29.049 ^{4}	29.030	[b]29.076	[c]28.999	[d]29.029	[c]28.932	[c]28.939	[c]29.095	28.929	29.060	29.071	29.121	29.042	29.063
Hillsdale	S. C.	28.819 ^{3}	28.808	[b]28.870	28.772	28.776	28.719	28.735	28.856	28.716	28.840	28.851	28.912	28.822	28.829
Kalamazoo	S. C.	29.067 ^{8}	28.971	29.033	28.955	29.016	28.879	28.880	28.990	28.864	28.974	29.000	29.067	29.003	28.995
Marshall	S. C.	....	29.038	29.089	29.013	29.016	28.954	28.962	29.083	28.946	29.070	29.072	29.134	29.057	29.065
Tecumseh	S. C.	29.142 ^{3}	29.135	29.198	29.113	[c]29.103	29.048	29.056	[b]29.182	[a]29.031	[e]29.145	29.171	[f]29.237	[f]29.155	29.180
Detroit	S. E.	29.320 ^{12}	29.315	29.374	29.309	29.303	29.230	29.228	29.367	29.202	29.329	29.348	29.403	29.331	29.357

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* For stations marked thus * a correction has been made for instrumental error, as follows: For Marquette .004 added; for Escanaba .012 added; for Mackinaw City .008 added; for Alpena .006 added; for Grand Haven .002 added; for Port Huron .001 subtracted; for Detroit .017 added; for Agricultural College .013 subtracted; for Kalamazoo .18 subtracted. For other stations the instrumental error of barometer is not known.

† At stations of the U. S. Signal Service for the year 1884 the observations were made at 7 A. M., 3 P. M., and 11 P. M., Washington mean time. The corresponding local time for each of these stations is stated in the star (*) foot-note to Table I., page 28.

‡ The names of observers, their places of observation, and the counties in which these places are situated, are stated in Exhibit 1, page 6. The full names of divisions, and the counties in each division, are stated in Exhibit 1, in a paper which follows, on the weekly reports of sickness.

§ Numbers in this column state the average annual atmospheric pressure for a period of years ending in each case with Dec. 31, 1884. The small figures at the right of the numbers which state the average, denote the number of years included in the average.

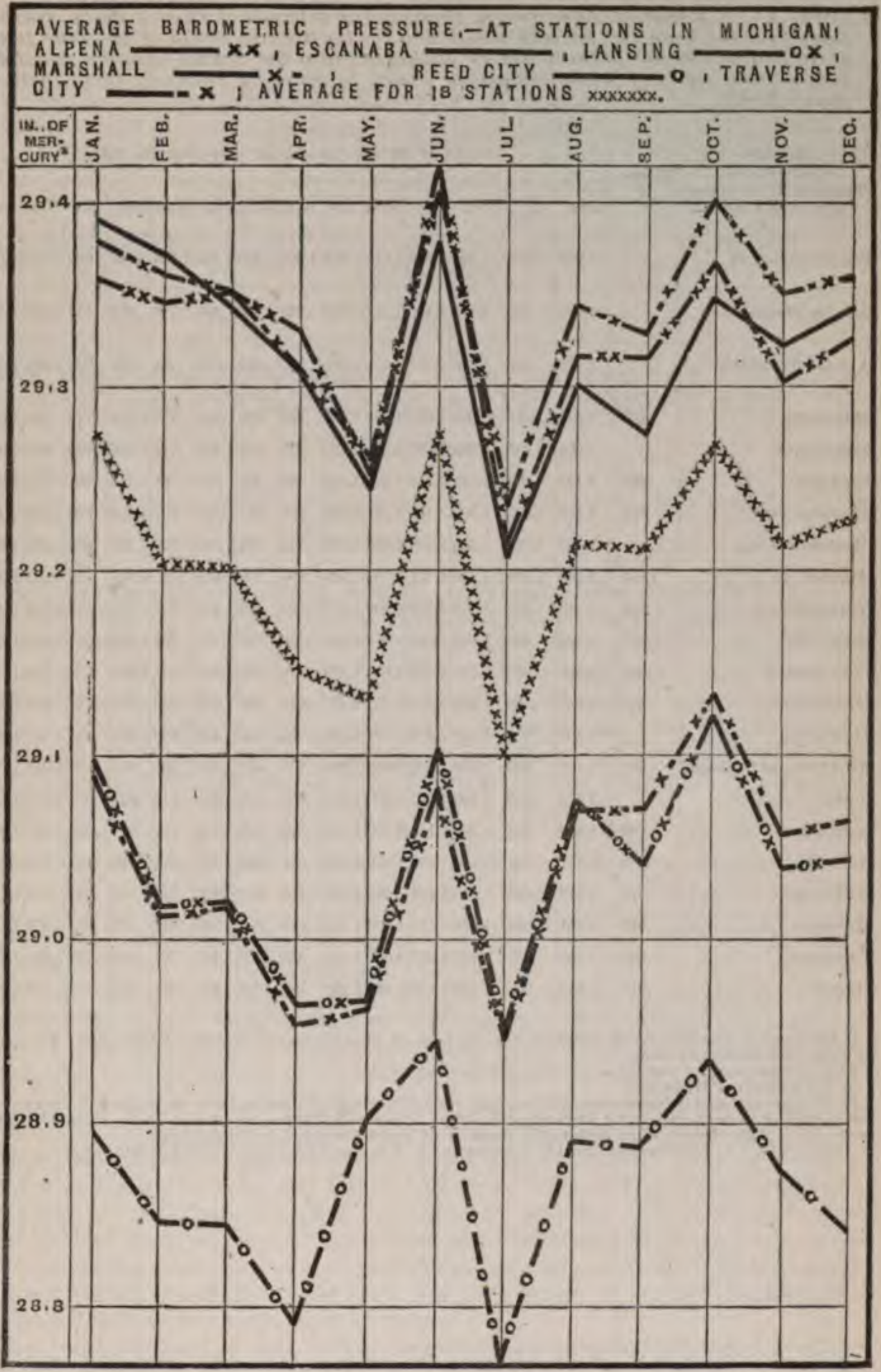
‖ This line is an average for only 18 stations. It does not include Hillsdale and Kalamazoo. Green's standard barometer was used at all these 20 stations except Kalamazoo for 1884. The barometer at Kalamazoo was manufactured by J. Foster, Cincinnati, Ohio.

[a] For 30 days. [b] For 29 days. [c] For 28 days. [d] For 27 days. [e] For 26 days. [f] For 25 days. [g] For 24 days. [h] For 20 days.

NOTE.—Daily and monthly averages for the year 1884 were furnished by the observers at Marquette, Escanaba, Mackinaw City, Alpena, Grand Haven, Port Huron, and Ann Arbor. The remainder of the computations were made at the office of the State Board of Health.

The lines for 6 stations in this Table are graphically represented in Diagram XV., page 85.

DIAGRAM XV.—ATMOSPHERIC PRESSURE, BY MONTHS, IN 1884.



*SCALE ONE TENTH INCH OF MERCURY TO .98 IN. VERTICALLY.

H. B. T., DEL. DES. BY H. B. B.

TABLE XVI.—*Range of Atmospheric Pressure (as determined from 3 daily observations*) for the Year and for each month and for the average month of the Year 1884, at 19 and at each of 19 Stations† in Michigan; also the Norm,—Average Monthly Range for a series of Years.—Stations named in order by Latitude, those farthest North first.*

Stations in Michigan. ‡ (Those of U. S. Signal Service in Italics.)	Norm. ††	Range of Barometer.—Year and Months, 1884.													
		1884.	Av. Mo.	Jan.	Feb.	Mar.	Apr.	May.	June	July.	Aug	Sept.	Oct.	Nov.	Dec.
For 19 stations§§	....	2.052	1.571	1.820	1.864	1.610	1.972	1.388	1.473	1.249	1.254	1.523	1.259	1.567	1.867
Av. for 19 stations‖	....	1.465	.969	1.293	1.196	1.114	1.250	.826	.656	.563	.726	.957	.779	1.016	1.251
Av. for 18 stations**	....	1.472	.976	1.308	1.205	1.122	1.260	.828	.659	.571	.731	.967	.787	1.019	1.258
Marquette	1.003^{3}	1.552	1.016	1.333	1.096	1.418	1.306	.865	.629	.745	.750	1.109	.978	.889	1.079
Manistique	....	1.506	1.047	1.336	1.293	1.297	1.272	.835	.637	.739	.744	1.236	.929	.995	1.255
Escanaba	.989^{3}	1.495	1.021	1.317	1.147	1.363	1.303	.847	.632	.651	.721	1.153	.901	.961	1.253
Traverse City	.980^{3}	1.468	1.027	1.330	1.180	1.217	1.390	.894	.643	.593	.727	1.109	.869	1.028	1.347
Mackinaw City	....	1.462	1.069	1.395	1.179	1.249	1.302	.840	.834	.833	.790	1.163	.885	1.088	1.273
Alpena	1.007^{2}	1.460	1.021	1.458	1.191	1.133	1.329	.801	.700	.581	.821	1.067	.806	1.024	1.341
Grand Haven	.925^{3}	1.413	.941	1.176	1.106	1.100	1.235	.890	.626	.485	.697	.828	.755	1.054	1.345
Reed City	.925^{3}	1.494	.965	1.262	1.043	.972	1.347	.855	.760	.585	.734	1.023	.617	1.106	1.276
Port Austin	.963^{2}	1.500	.972	1.319	1.299	1.058	1.373	.812	.652	.542	.744	1.070	.788	.838	1.164
Port Huron	.944^{2}	1.539	.966	1.276	1.373	1.055	1.450	.779	.635	.496	.723	.863	.749	.985	1.202
Thornville	....	1.501	.953	1.359	1.327	.994	1.236	.755	.657	.476	.693	.844	.738	1.051	1.311
Agricultural College	.907^{2}	1.402	.932	1.252	1.238	1.052	1.166	.783	.611	.511	.707	.863	.709	1.010	1.280
Ionia	....	1.472	.940	1.293	1.143	1.039	1.231	.853	.625	.515	.719	.918	.697	1.070	1.173
Lansing	.908^{3}	1.418	.944	1.220	1.155	1.050	1.182	.840	.601	.496	.717	.876	.687	1.197	1.304
Ann Arbor	.889^{3}	1.451	.947	1.315	1.283	1.086	1.107	.801	.632	.586	.765	.813	.743	.976	1.257
Hillsdale	.818^{3}	1.349	.838	1.030	1.041	.959	1.075	.780	.599	.423	.635	.776	.635	.965	1.142
Marshall	.910^{2}	1.454	.939	1.276	1.112	1.050	1.182	.845	.673	.509	.682	.826	.781	1.083	1.244
Tecumseh	.899^{3}	1.456	.937	1.292	1.267	1.007	1.163	.832	.675	.482	.708	.808	.778	1.002	1.234
Detroit	.916^{2}	1.450	.934	1.329	1.255	1.058	1.108	.780	.636	.458	.708	.839	.762	.980	1.298

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§§ Represents the difference between the highest of 19 stations and lowest of 19 stations for year and for each month of year.

‖ Represents sum of ranges at all stations divided by 19.

** Not including Hillsdale.

†† Numbers in this column state the average monthly range of atmospheric pressure for a period of years ending in each case with December 31, 1884. The small figures above and at the right of numbers which state the average, denote the number of years included in the average.

NOTE.—The *, †, ‡ references and the note to Table XV., page 83, apply also to Table XVI.

THE TIME OF GREATEST PREVALENCE OF EACH DISEASE.

CONTRIBUTIONS TO THE STUDY OF THE CAUSES OF DISEASES.

A STATISTICAL REPORT BASED ON WEEKLY REPORTS OF DISEASES IN MICHIGAN DURING THE YEAR 1884, AND PRECEDING YEARS.

BY THE SECRETARY OF THE STATE BOARD OF HEALTH.

Progress in sanitary science and in practical public health work is not possible without a large array of well marshalled facts—such as shall be worthy of the name of statistics. It is in this way only that sanitary science can master the complex questions which relate to the causation and prevention of disease. To be of value in the establishment of laws in sanitary science, the observations and statistics on which conclusions are based must be continued a long time in the same line of investigation. The collection of facts respecting sickness in numbers sufficient to constitute trustworthy health statistics involves no small amount of labor,—more labor than can be undertaken by any one person or association of persons. It is therefore important that such work be carried on by State authority. In view of the magnitude of the interests involved in the questions of the causes and best means for the prevention of diseases, the collection and compilation of health statistics must be considered the most important work in which the sanitary departments of our governments can be engaged.

It was with a high appreciation of the importance of collecting health statistics that the "Weekly Reports of Diseases" in Michigan was begun in 1876. These reports are now made by health officers of cities and villages, and by regular correspondents of the Board in all parts of the State. This paper presents a summary of a compilation of these reports, and certain deductions made from them when studied in connection with a compilation of meteorological conditions for the year 1884. It includes a series of graphic illustrations which show the rise and fall of eighteen of the most prominent diseases occurring in Michigan, showing the times of greatest and of least danger from each of these diseases. It includes also statements in the form of propositions calling attention to one method of learning certain laws that seem to grow out of the relations between the prevalence of certain diseases and the coincident meteorological conditions.

The plan of making the weekly reports was somewhat changed in May, 1885. The change will be duly taken into account in the compilation of the "Weekly Reports of Diseases" for the calendar year 1885. Suffice it to say that the change made secures an increased number of weekly reports, and changes the sickness reported from that according to the observer's best knowledge and belief to that actually existing *under his own observation.* It is believed that this change will place these statistics on a still firmer scientific basis.

The only change made in the method of compiling the reports for the year 1884 is the leaving out the columns relating to the "Severity of Disease" in table 2. This change was decided upon from a careful study of the reports relating to "Severity" in connection with the prevalence of typhoid fever as tabulated in the reports of this Board and from the mortality reports of typhoid fever published in the Vital Statistics of Michigan. By comparing the *sickness* statistics with the *deaths* statistics the proportion of fatal cases which represents the actual severity can be much better learned than by the method of reporting "Severity" which has been in use heretofore. The names and addresses of observers whose reports for 1884 have been compiled are printed in Exhibit III, pages 114–116.

Weekly reports are now received concerning twenty-seven diseases, the names of which are printed on the blank, and concerning the presence or absence of which a positive report is made each week. Inflammation of kidney was first printed on the blanks sent out in July, 1883, and has been compiled with other diseases in 1884 for the first time.

Some interesting questions arise as to the comparative amount of sickness that prevails in different parts of the State. Thus from a study of the per cent. of reports of presence of diseases in the several divisions of the State shown in Exhibit V., pages 118, 119, consumption and bronchitis appear to be less prevalent in the western divisions, and in the northern and northern central divisions. Bronchitis seems to have been especially prevalent in the northeastern division and in the upper peninsula. The average for all tabulated diseases reported present is also less in the western and northern divisions of the State than in the eastern. This is shown in the upper line of Table 4, pages 112, 113. But without a greater number of reports than are now received it is not possible to make accurate comparative estimates of sickness in different localities; and such comparisons with the present amount of information may be misleading. Reports are now received in sufficient number, however, to make very satisfactory data for the State as a whole. It is believed that one hundred observers in active general practice in as many different parts of the State will, on an average, see a fair average of the diseases which prevail throughout the State. The work of compiling these reports is great. Few persons unacquainted with the labor of collecting and compiling statistics realize how great. It is, therefore, a question whether this office wants to undertake now the labor of compiling a sufficient number of reports, even if they could readily be obtained, to render it possible to study the relations of sickness to localities. In order to do this successfully it will be necessary to study not only the comparative sickness but also the comparative conditions likely to affect the sickness in each locality.

An important work has been done in learning the time of greatest prevalence of each disease, and consequently the time of greatest danger from each disease in the State considered as a unit. This has been done more successfully in Michigan than in any other State or country. The study of the comparative prevalence of disease in the different parts of the State is a matter for subsequent study, while the certainty that has been reached that certain meteorological conditions invarably produce an increased or diminished amount of sickness from several of the diseases studied is of great practical importance, as it gives a clue to the methods that must be adopted for the prevention of each of these diseases.

The following circular letter was sent to reporters of diseases in May, 1885:

"For the purpose of learning the causes of diseases, by means of a compilation of facts, it is just as important to know when, where, and under what condition there is no sickness, or but little sickness, from any disease, as to know when there is much sickness from that disease. It is therefore earnestly requested that every observer will carefully note and report on the postal blanks the facts concerning each disease, whether there is much sickness, little sickness, or no sickness, from the disease. General statements concerning the amount of sickness, though useful, cannot supersede definite statements concerning each disease, such as is provided for on the blank report card. The omission of a report for a single week increases the work, and impairs the value of the compilation. For these reasons it is very desirable that all observers should be as regular and prompt as possible in sending in their reports."

The following was sent to observers of diseases in September, 1885:

[Printed Letter to Observers of Diseases.]

[94.] OFFICE OF THE SECRETARY OF THE STATE BOARD OF HEALTH,
Lansing, Michigan, September, 1885.

To Observers of Diseases, including Health Officers of Cities and Villages:

GENTLEMEN,—

1. The object of the postal-blank for weekly report of sickness is to enable you to report to this office all diseases that come *under your own observation*, whether contagious or not, and regardless of the area of territory or extent of population to which your practice extends. In case of a contagious disease it is important for this office to know promptly in what township, city, or village the disease is. This information can be placed at the bottom of the postal report.

2. The postal reports should be made to include *only cases of sickness under your own observation.* Other physicians are not required by law to report to the health officer any cases except those of contagious diseases. For this, and for other important reasons, it is impracticable and not desirable to make the weekly postal-card report of sickness include any cases except those under the observation of the reporter.

3. While there is no compensation to the regular correspondents of this Board, and probably little compensation to health officers of cities and villages who act as observers for this Board, yet the consciousness of important service well done in the interests of public health, should be some reward to those who contribute so greatly to this work, as do those who make postal reports every week relative to the sickness under their observation; because this information, when compiled for the State as a whole, supplies data of very great importance in the study of the causes of diseases; and without such information little progress can be made in efforts for the prevention of diseases.

4. Reports of contagious diseases by health officers should be made separate and distinct from the weekly postal-card reports.

5. The object of the (M*) blank which is supplied to health officers, is to enable each health officer to report to this office any case of contagious disease that occurs in his jurisdiction, whether under his own observation or not.

Very respectfully,
HENRY B. BAKER, Secretary.

*See page 254, Report for 1884.

Great credit is due the busy practitioners who forward the reports of sickness. Some of them have made the reports regularly since this plan was adopted in 1876. The service is, as a rule, without compensation. No other class of persons, however, has so great a knowledge of the facts that are necessary in the compilation of health statistics; and it is greatly to the credit of physicians that they are so willing to coöperate in every effort made to advance the public health.

PRESENT PLAN OF THE REPORTS.

The method of securing and the plan of making these reports may be thus stated:

The blanks for the weekly reports are printed on postal cards, which are supplied to the observers of diseases. Blank record books, in which to preserve copies of the reports, remarks, etc., are also supplied to these observers, to be retained by them. The reports are forwarded weekly to the Secretary of the State Board of Health, at Lansing.

The plan of making the report is as follows: Each observer is requested to mark the disease of which there was the greatest number of cases under his observation during the week for which the report is made, 1; that of which there was the next greatest number of cases, 2; the next, 3, and so on, applying *consecutive* numbers to the diseases reported present; but marking with the *same* figure all diseases of which there is the same number of cases; to write 0 opposite each disease mentioned of which there was no case; to apply these numbers without regard to the severity of the cases; to include all cases, without regard to when they were taken sick, so long as they are actually sick with the given disease; to include all cases "under the observation" of the observer. A blank is left on the card for the convenience of those observers who prefer to state the number of cases rather than the order of prevalence by the foregoing method.

To illustrate the method of making the reports, the following copy of one of the blanks now in use is given, correctly marked, in the "prevalence" column, for the number of cases stated on the right-hand margin. It should be remembered that the numbers in the "prevalence" column denote simply the relative order in which the several diseases appear to be prevalent, and do not denote a definite number of cases; so that a disease might one week be marked *4*, and the following week, with the same number of cases, be marked *1*. Names of diseases and figures printed in italics are not *printed* on the postal blanks, but are supposed to have been *written* on the report by the observer.

☞ *Diseases in*..[and vicinity?] ☜
[PLEASE DATE.]
week ending Sat.,..............................., *188*.....

No. ....

ED 23.

a. Please mark the disease of which there is the greatest number of cases, 1; the disease having next greatest number of cases, 2; the next, 3; and so on for each disease, writing the same figures opposite diseases having the same number of cases. Write 0 opposite each disease of which there is no case under your observation. [For full statement of plan, see second, third, and fourth pages of record-book cover.] A blank indicates that the item has been overlooked.

Please mail this, ☞ signed and dated, ☜ as soon as convenient after close of week specified.

	Prevalence. Order. See a.	*Cases.*
Brain, Inflammation of......	*14*	*1*
Bowels, Inflammation of....	*12*	*3*
Bronchitis..................	*11*	*4*
Cerebro-spinal Meningitis.	*0*	*0*
Cholera Infantum	*8*	*9*
Cholera Morbus.............	*10*	*6*
Consumption, Pulmonary..	*10*	*6*
Croup, Membranous.........	*12*	*3*
Diphtheria	*5*	*14*
Diarrhea.....................	*3*	*17*
Dysentery	*8*	*9*
Erysipelas....................	*13*	*2*
Fever, Intermittent.........	*2*	*21*
Fever, Remittent............	*11*	*4*
Fever, Typhoid (Enteric)..	*0*	*0*
Fever, Typho-malarial......	*9*	*7*
Influenza	*7*	*11*
Kidney, Inflammation of....	*14*	*1*
Measles	*1*	*27*
Neuralgia	*14*	*1*
Pneumonia...................	*9*	*7*
Puerperal Fever............	*0*	*0*
Rheumatism	*6*	*12*
Scarlatina....................	*4*	*16*
Small-pox....................	*0*	*0*
Tonsilitis	*11*	*4*
Whooping-cough	*0*	*0*
Mumps	*6*	*12*
Dyspepsia	*11*	*4*
....	....	.....

☞ This report is of diseases UNDER YOUR OBSERVATION; if it includes a contagious disease, please mention, on the bottom or margin of this card, the township, city, or village in which the disease is.

...., *M. D.*

COMPILATION OF THE WEEKLY REPORTS.

Some of the methods of compiling the reports are set forth in connection with tables on following pages; it is somewhat more fully explained on pages 306, 307 and 310 of the Report for 1881. Table 3, giving statements by months for each locality from which reports were received for 1884, has been prepared; but to avoid making a bulky volume, it is not printed in this report. The manuscript is preserved for reference and future study.

THE PREVALENCE OF THE SEVERAL DISEASES IN 1884.

One of the best indications afforded by the weekly reports, as to the relative prevalence of the several diseases, is to be found by noting what per cent of all the reports received for a given time stated the presence of each disease. This per cent has been computed for each disease, by months, and for the year 1884. It is thus stated in Exhibit I, page 94, which also states the per cent for each disease for each of the preceding eight years. What per cent of reports stated the presence of each disease by months in 1884, is graphically represented in Diagrams 1–5, on page 95, and following pages.

For several diseases a comparison has been attempted of the amount of sickness in 1884 (as indicated by the proportion of reports stating presence of the disease) with the average amount for a period of eight years. These comparisons are stated in Exhibits IX, XI, XVI, and XVIII. This comparison may also be facilitated by reference to Table 1, pages 97, 98, and 99, in which is stated for each of the years 1877–84, and by months in each of those years, by what per cent of the observers reporting for the given month (or for an average month of the year) the several diseases were reported.

A study of the reported sickness from 18 diseases, in connection with meteorological conditions, by months in 1884, is made in Exhibit VIII and following exhibits. By arranging months in order of greatest prevalence of the disease under consideration, noting whether it was more or less prevalent than the average for the year, and noting what were the meteorological conditions for the same months, as compared with the average for the year, relations and conditions are grouped for convenient comparison. A summary of one line of the evidence of these exhibits is given in Exhibits XXII and XXIII.

WHAT DISEASES CAUSE MOST SICKNESS.

In Exhibits IV and V, on pages 117, 118, and 119, the leading diseases are arranged in order according to greatest amount of sickness reported from them in 1884, as thus affording an indication as to what diseases cause most sickness. It will be noticed that for the State neuralgia heads the list. In former years intermittent fever heads the list, but in 1884 it takes third place, and rheumatism second.

The comparison with former years is facilitated by reference to Exhibit I, page 94, Table 1, pages 97, 98, and 99, and Exhibits IX, XI, XVI and XVIII, and exhibits on following pages.

DISEASES FROM WHICH THERE WAS A MARKED INCREASE, OR LESSENED PREVALENCE IN MICHIGAN, IN 1884.

By referring to Exhibit XVIII, it will be seen that intermittent fever and remittent fever show a marked decrease in 1884 when compared with the eight years 1877–84. The same exhibit shows measles to have decreased for the year, and for each month of the year, except January and February, when compared with the eight years, 1877–84. Diarrhea is shown to have increased for the year, and for each month of the year, except in February, March and July, when compared with the average for the eight years 1877–84.

Exhibit XI shows a marked decrease of pneumonia and diphtheria in 1884, and in each month in the year 1884, when compared with the average for the eight years 1877–84. The same exhibit shows an increased prevalence of neuralgia for the year, and for each month of the year, 1884, when compared with the average for the eight years 1877–84.

Exhibit XVI shows, for 1884, a marked decrease in consumption for the year, and for each month in the year, except August, when compared with the average for the eight years 1877–1884.

Reference having been made, in the article which precedes this, to "Exhibit 1" in this article, as containing a list of counties included in each "Division" of the State, the Exhibit is made to precede the first exhibit in this article, to aid in finding it without reference to the index, and that reference may better be made to it further on in this article. On page 113 of the Report of this Board for 1883, the divisions and the counties in each were indicated by lines on a map of the State.

EXHIBIT 1.—*Eleven Geographical Divisions of the State, formed for the purpose of facilitating the study of Causes of Sickness and of Deaths, with a list of Counties included in each Division.*

1.-Upper Peninsular.	2.-North-western.	3-.Northern.	4.-North-eastern.	5.-Western.	6.-Northern-Central.	7.-Bay and Eastern.	8.-Central.	9.-South-western.	10.-Southern-Central.	11.-South-eastern.
Alger.	Benzie.	Antrim.	Alcona.	Kent.	Clare.	Arenac.	Barry.	Allegan.	Branch.	Macomb.
Baraga.	Gr. Traverse.	Charlevoix.	Alpena.	Lake.	Gladwin.	Bay.	Clinton.	Berrien.	Calhoun.	Monroe.
Chippewa.	Leelanaw.	Cheboygan.	Iosco.	Mason.	Isabella.	Huron.	Eaton.	Cass.	Hillsdale.	Oakland.
Delta.	Manistee.	Crawford.	Montmorency.	Muskegon.	Mecosta.	Lapeer.	Genesee.	Van Buren.	Jackson.	Wayne.
Houghton.	Manitou.	Emmet.	Ogemaw.	Newaygo.	Midland.	Saginaw.	Gratiot.		Kalamazoo.	
Iron.	Missaukee.	Kalkaska.	Oscoda.	Oceana.	Roscommon.	Sanilac.	Ingham.		Lenawee.	
Isle Royal.	Wexford.	Otsego.	Presque Isle.	Osceola.		St. Clair.	Ionia.		St. Joseph.	
Keweenaw.				Ottawa.		Tuscola.	Livingston.		Washtenaw.	
Mackinac.							Montcalm.			
Marquette.							Shiawassee.			
Menominee.										
Ontonagon.										
Schoolcraft.										

EXHIBIT I.—*Stating for each of 27 Diseases for the eight Years ending Saturday, January 3, 1885, for each of those Years, and by Months of the Year 1884, on what Per Cent of the Reports Received the Disease was stated to be Present.—Compiled from Weekly Reports by Health Officers of Cities and Villages, and by Regular Correspondents of the State Board of Health.**

Diseases.	What Per Cent of Reports Received Stated Presence of the Disease.																				
		Years.								Months, 1884.											
	Av.,1877-84.	1877.	1878.	1879.	1880.	1881.	1882.	1883.	1884.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
Average.................†	31	28	30	33	32	33	30	30	29	28	29	30	28	28	29	30	34	34	33	30	29
Brain, inflam. of........	....	....	....	....	6	5	5	6	7	7	7	8	6	6	8	8	9	8	5	8	5
Bowels, inflam. of......	....	....	....	....	12	14	13	16	17	12	12	17	11	12	18	20	24	25	17	17	16
Bronchitis..............	63	55	64	64	64	62	65	66	61	71	71	71	65	59	56	49	47	50	56	68	70
Cerebro-spinal Men...	5	3	2	2	2	9	6	5	7	4	7	9	10	6	6	5	10	7	5	4	8
Cholera Infantum......	14	11	11	14	14	18	12	14	15	1	3	4	6	5	14	29	43	47	22	7	3
Cholera Morbus........	16	15	14	19	20	26	17	18	22	5	5	9	6	7	26	44	52	51	29	12	9
Consumption, Pul......	65	52	71	70	68	71	66	61	63	56	61	66	70	67	65	63	63	63	65	60	58
Croup, Membranous..	7	6	7	7	6	9	7	6	6	7	10	5	4	5	4	4	4	5	7	10	10
Diphtheria..............	24	19	23	29	27	34	25	17	15	17	13	16	12	17	13	8	14	10	18	19	20
Diarrhea................	47	41	41	48	47	52	48	49	52	28	27	26	38	45	52	73	88	88	70	46	35
Dysentery	20	21	19	18	18	23	17	21	23	10	7	12	10	11	17	36	50	60	44	15	8
Erysipelas...	23	20	21	25	25	23	22	25	26	23	24	24	25	27	24	28	28	24	27	28	26
Fever, Intermittent...	76	75	82	82	82	82	71	69	65	56	56	57	65	68	72	76	73	73	72	61	53
Fever, Remittent.......	51	52	58	57	56	54	48	41	44	38	40	40	42	40	43	50	47	53	54	43	40
Fever, Typhoid (En.)..	13	14	10	12	14	18	14	11	12	10	7	8	6	5	4	7	14	19	23	23	13
Fever, Typho-malarial	23	26	24	22	24	29	24	18	20	14	12	13	11	12	12	14	23	33	39	33	23
Influenza	41	41	44	45	42	35	40	43	41	55	51	50	49	42	30	27	47	34	37	41	49
Kidney, inflam. of.....	....	....	....	....	....	....	....	....	26	28	31	29	26	29	27	24	23	22	26	25	27
Measles..................	14	7	5	12	19	26	11	24	10	16	16	14	14	17	13	5	4	4	4	4	4
Neuralgia	....	....	....	59	64	65	68	69	70	69	73	74	76	74	67	68	64	63	68	73	73
Pneumonia	39	40	41	41	42	41	39	38	29	54	49	43	39	24	18	16	11	10	21	29	34
Puerperal Fever.......	5	4	3	3	3	5	7	7	7	8	9	10	6	6	7	6	8	7	6	6	7
Rheumatism............	69	60	68	72	71	71	68	68	70	65	67	70	75	77	73	67	68	67	67	70	76
Scarlatina..............	20	21	25	23	15	19	18	19	16	19	25	28	22	25	14	12	12	9	9	10	15
Small-pox...............	1.3	4	0.2	0.4	0.4	2	3	0.3	0.1	0	0	0	0	1	0	0	0	0	0	0	0
Tonsilitis................	....	....	....	45	49	48	48	50	50	53	59	56	53	52	45	38	38	39	48	58	57
Whooping-cough.......	21	21	21	23	32	16	17	15	23	21	21	20	16	21	22	28	29	22	15	14	17
No. of reports rec'd....	3877	3320	3221	3755	3991	3567	4745	4458	3957	385	306	304	321	281	301	407	315	302	362	301	372

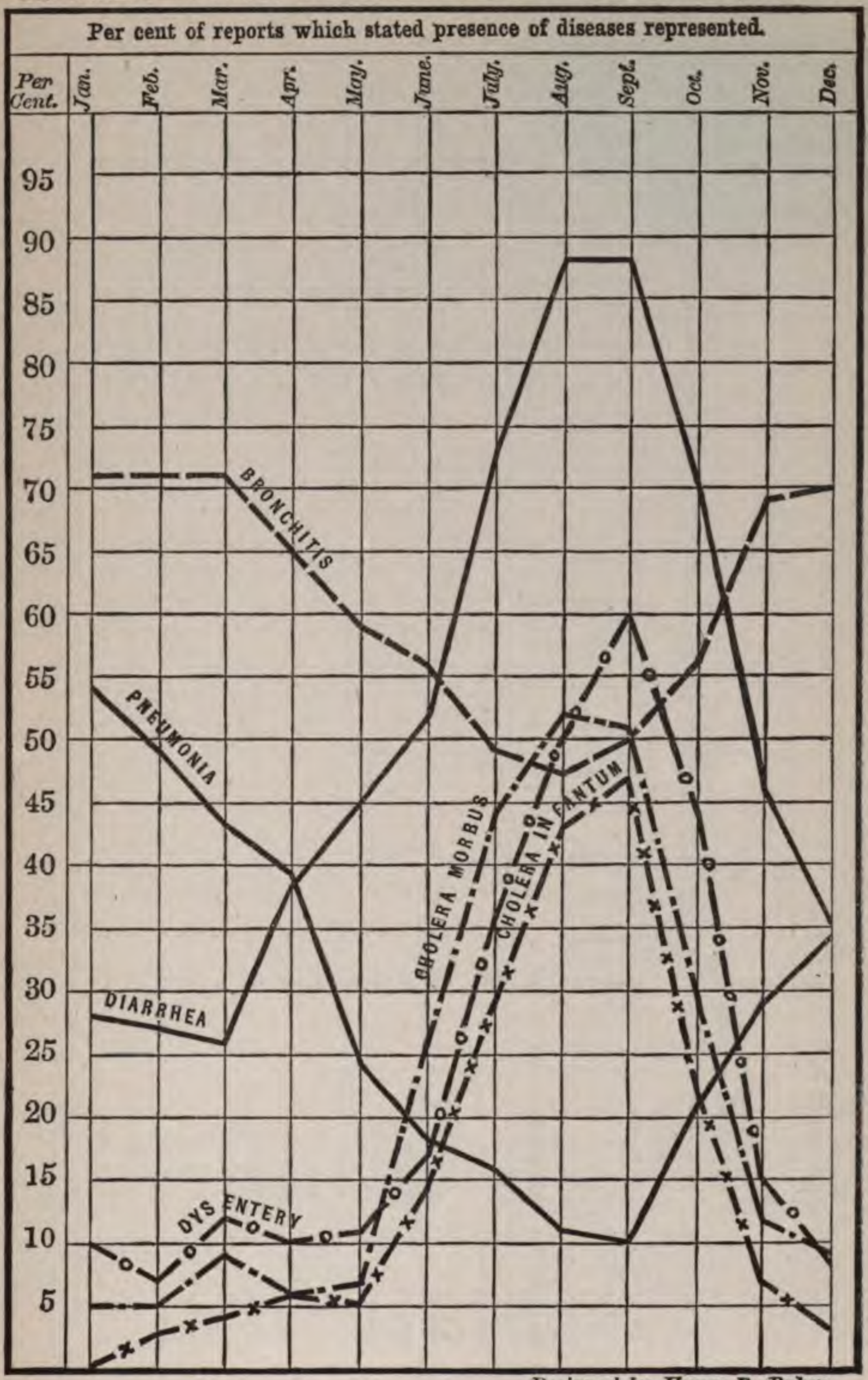
Statements in this Exhibit for months in 1884 are graphically represented in Diagrams 1, 2, 3, 4, 5, opposite this page, and on following pages.

* For 1884, the names of observers are stated in Exhibit III, pages 114–116.

† This line is an average for such of the tabulated diseases as were reported present in the given month or year.

‡ See foot-note with this mark in Table 1, page 97.

DIAGRAM 1.—WEEKLY REPORTS OF DISEASES IN MICHIGAN, IN 1884.



Designed by Henry B. Baker.

EXHIBIT II.—*Stating, by Months of the Year ending Saturday, January 3, 1885, for the State, and for each of the Eleven Geographical Divisions of Michigan from which Weekly Reports of Diseases were received, the Number of Observers from whom the Reports were received; the Number of Reports Received; the day on which, for the purposes of this compilation, each month is made to end; and the Number of Weeks thus included in each Month.*

Months, 1884.	Months and Year End Saturday.	Number of Weeks.	State.		Divisions of the State.*																					
					1. UpperPeninsular*		2. North-Western*		3. Northern.*		4. North-Eastern.*		5. Western*		6. Northern Central.*		7. Bay and Eastern.*		8. Central.*		9. South-Western*		10. Southern-Central.*		11. South-Eastern.*	
			Observers.	Reports. †	Observers.	Reports. †	Observers.	Reports. †	Observers.	Reports. †	Observers.	Reports. †	Observers.	Reports. †	Observers.	Reports. †	Observers.	Reports. †	Observers.	Reports. †	Observers.	Reports. †	Observers.	Reports. †	Observers.	Reports. †
Year, 1884	Jan. 3, 1885	53	142	3,957	7	162	5	182	3	86	5	115	15	349	7	124	15	408	35	941	13	333	24	831	13	426
Av. per month		...	79	330	3	14	4	15	2	7	2	10	7	29	3	10	8	34	19	78	7	28	17	69	8	36
January	Feb. 2	5	80	385	4	20	2	10	1	5	2	10	9	40	2	10	6	30	22	107	9	41	16	78	7	34
February	Feb. 29	4	80	306	5	19	3	10	1	4	2	8	9	35	2	8	7	26	20	76	7	28	17	64	7	28
March	March 29	4	79	304	5	20	3	11	1	4	2	8	9	32	3	12	7	28	20	75	6	24	16	62	7	28
April	May 3	5	68	321	3	14	3	15	1	5	2	10	5	21	2	8	6	30	18	84	5	24	16	75	7	35
May	May 31	4	74	281	3	11	4	16	1	4	2	8	6	24	2	8	8	30	18	69	5	19	18	65	7	27
June	June 28	4	84	301	2	6	4	16	2	6	2	8	8	27	3	8	10	36	20	72	7	23	16	63	10	36
July	Aug. 2	5	87	407	2	9	4	18	2	10	2	9	10	45	3	14	10	48	20	93	8	36	16	78	10	47
August	Aug. 30	4	84	315	3	12	4	15	2	7	3	11	6	23	2	8	9	35	18	69	8	30	18	63	11	42
September	Sept. 27	4	80	302	3	12	4	16	1	4	2	8	6	23	2	8	9	34	19	72	8	28	18	67	8	30
October	Nov. 1	5	74	362	3	14	4	20	2	10	2	10	5	25	3	14	9	42	16	79	7	33	15	75	8	40
November	Nov. 29	4	78	301	3	12	4	16	3	12	3	10	6	24	3	12	9	32	16	64	6	22	16	62	9	35
December	Jan. 3, 1885	5	77	372	3	13	4	19	3	15	3	15	6	30	3	14	8	37	17	81	5	25	16	79	9	44

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* For counties in each division, see Exhibit 1, page 93.

† From some of the observers reports were not received for every week, so that the number of reports received does not equal the number of observers multiplied by the number of weeks in the given month or in the year.

‡ In some localities there were more observers than one. The whole number of localities from which reports were received was 119; the average number per month was 79. The names of observers and number of cards received from each observer for each month and for the year is stated in Exhibit III, pages 114-116.

TABLE 1.—*Stating, by Months in each of the 8 Years ending Saturday, January 3, 1885, also by a Monthly Average for each of those Years and for the entire period, by what Per Cent of Observers each of 27 Diseases was Reported Present (also the Number of Observers Reporting for the Month).—Compiled from Weekly Reports by Health Officers of Cities and Villages and from Regular Correspondents of the State Board of Health.*—Diseases arranged by Year and Months in order of Greatest Number of Observers reporting them present in 1884.—(Continued on pages 98–99.)*

Line Number.	Diseases.	Observers by whom the Several Diseases were Reported Present.—Average Per Cents† (per month) of those making Reports.								
		Average 1877-84.	1884.	1883.	1882.	1881.	1880.	1879.	1878.	1877.
	Av'age for Tabulated Diseases Reported Present.	42	42	43	43	45	43	44	39	38
1	Neuralgia‡	....	84	85	85	78	79	75	....	......
2	Rheumatism	83	83	83	85	84	85	85	81	78
3	Intermittent Fever	86	79	82	83	90	90	90	90	85
4	Bronchitis	76	74	79	80	74	77	75	75	71
5	Tonsilitis	....	73	73	72	65	67	68	....	......
6	Consumption, Pulmonary‡	73	72	71	74	78	76	78	76	61
7	Diarrhea	65	71	67	69	67	63	65	57	58
8	Remittent Fever‡	65	60	57	64	66	67	69	71	68
9	Influenza	54	53	56	55	48	54	57	57	54
10	Pneumonia	58	48	59	61	60	62	60	58	56
11	Erysipelas	42	48	47	42	42	45	43	35	35
12	Inflammation of Kidney‡	....	41	....	....	....	....	....	....	......
13	Dysentery	33	38	35	31	34	30	31	30	34
14	Cholera Morbus	33	37	32	31	41	34	34	25	26
15	Typho-malarial Fever‡	36	32	32	39	43	37	32	35	37
16	Inflammation of Bowels‡	....	30	31	28	26	25	....	....	......
17	Whooping-cough	29	29	23	26	24	42	31	28	28
18	Scarlatina	32	29	32	32	32	26	36	38	33
19	Diphtheria	39	27	31	43	54	43	45	37	32
20	Cholera Infantum	23	26	24	22	27	23	23	20	17
21	Typhoid Fever (enteric)	21	20	19	24	26	21	18	16	22
22	Measles	22	17	37	20	37	30	18	7	12
23	Puerperal Fever	12	16	15	18	12	8	8	6	10
24	Inflammation of Brain‡	....	14	12	12	12	13	....	....	......
25	Membranous Croup	15	14	14	15	19	13	16	14	14
26	Cerebro-spinal Meningitis	9	12	11	12	16	6	5	6	6
27	Small-pox	2	0.2	1	5	4	1	1	1	5
	Number of Observers		142	140	159	116	112	110	97	115
	Av. No. of Observers per Month	77	79	88	93	70	79	73	64	66

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* For 1884 the number of observers, reports, weeks in each month, etc., are stated in the first five columns of Exhibit II, page 96; the names of the observers and the number of the reports received from each are stated in Exhibit III., pages 114–116.

† The numbers opposite the names of the diseases do not state what per cent of the whole number of observers for the year reported the disease present at some time during the year, but state (on an average for the twelve months of the year) by what per cent of the observers making reports for the several months the disease was reported present in those months. The column for each year is thus a statement for an average month of that year. On the two following pages of this table, however, the columns for each month state what per cent of the observers for that month (the number of whom is stated at the foot of the column) reported the given disease in that month.

‡ Consumption, remittent fever, and typho-malarial fever were not printed on the first blanks used in making weekly reports (beginning with the month of September, 1876); neuralgia and tonsilitis were not printed on any blanks used prior to October, 1878, and not on all used for several months after that date; inflammation of brain and inflammation of bowels were not printed on any blanks used prior to July, 1879, and not on all used for several months after that date; inflammation of kidney was not printed on any of the blanks used prior to July, 1883, and not on all used for several months after that date; hence it is probable that these diseases were not so fully reported at first as were the other diseases.

TABLE 1.—CONTINUED.—*Per Cents of Observers by whom the several Diseases were*

Per Cents of Observers by whom Diseases were Reported Present.

Line Number.	January.*							February.*							March.*						
	Diseases.	Av. '77-'84.	1884.	1883.	1882.	1881.	1880.	Diseases.	Av. '77-'84.	1884.	1883.	1882.	1881.	1880.	Diseases.	Av. '77-'84.	1884.	1883.	1882.	1881.	1880.
	Av. Disease†	43	41	44	43	44	42	Av. Disease†	42	40	42	42	44	42	Av. Disease†	42	41	44	44	46	44
1	Neuralgia‡	83	84	96	86	81	84	Neuralgia‡	83	84	91	82	83	82	Neuralgia‡	87	84	91	87	90	91
2	Bronchitis	88	83	90	86	90	88	Bronchitis	88	81	90	83	90	94	Rheumatism	86	82	80	89	93	88
3	Rheumatism	88	81	96	86	83	95	Rheumatism	85	81	84	82	87	92	Bronchitis	87	80	91	85	90	92
4	Tonsilitis‡	81	79	87	81	81	78	Tonsilitis‡	79	79	82	76	76	78	Tonsilitis‡	80	77	82	76	82	79
5	Pneumonia	82	79	80	76	86	82	Pneumonia	83	73	78	85	91	86	Consumption‡	76	75	75	74	84	81
6	Int'rmitt'nt Fever	77	71	76	75	80	81	Interm't Fever	76	65	77	78	79	80	Int. Fever	80	73	76	84	85	84
7	Influenza	71	69	66	65	67	75	Consumption‡	74	65	80	79	84	77	Pneumonia	80	63	83	84	78	91
8	Consumption‡	74	65	80	73	79	73	Influenza	72	64	74	63	71	78	Influenza	71	61	82	66	70	75
9	Remittent Fever‡	58	58	57	61	56	53	Remit'nt Fever‡	54	53	47	55	56	54	Remittent Fev'r‡	57	53	54	51	57	60
10	Diarrhea	46	51	54	58	44	45	Diarrhea	43	48	52	46	51	39	Diarrhea	47	46	49	59	55	46
11	Erysipelas	48	51	54	45	49	46	Infl. of Kidney‡	..	46	..	..	..	..	Erysipelas	46	42	47	44	55	53
12	Infl. of Kidney‡	..	45	..	..	..	..	Erysipelas	44	44	53	38	49	43	Infl. of Kidney‡	..	41	..	..	..	..
13	Diphtheria	49	35	43	56	56	41	Scarlatina	40	40	33	39	44	31	Scarlatina	43	39	40	41	48	34
14	Whooping-cough	..	34	22	27	30	39	Whoop-cough	..	30	23	25	23	40	Whooping-cough	..	29	20	29	22	45
15	Scarlatina	40	34	40	34	40	34	Measles	23	29	32	19	44	30	Infl. of Bowels‡	28	27	24	32	28	29
16	Measles	20	26	33	18	27	24	Infl. of Bowels‡	24	21	29	26	27	16	Diphtheria	40	25	34	45	51	49
17	Typho-mal Fev'r‡	32	25	32	46	30	39	Diphtheria	43	20	39	49	60	45	Measles	29	25	43	29	55	41
18	Infl. of Bowels‡	26	24	30	26	19	29	Typho-mal F.‡	25	19	26	39	27	29	Dysentery	16	20	21	21	12	13
19	Dysentery	16	21	24	14	11	16	Mem. Croup	21	19	19	19	33	17	Puerperal Fever	14	18	16	17	16	8
20	Typhoid Fever	20	19	21	35	20	18	Puerperal Fever	12	16	13	22	13	6	Cholera Morbus	14	18	16	16	16	14
21	Inflam. of Brain‡	11	19	7	9	9	13	Cer-spinal Men.	9	14	11	15	7	2	Inflam. of Brain‡	13	16	10	11	16	13
22	Mem. Croup	25	19	21	20	30	20	Infl. of Brain‡	13	14	11	14	10	17	Typhoid Fever	13	16	10	17	13	15
23	Puerperal Fever	13	18	16	13	11	8	Typhoid Fever	15	13	9	27	16	22	Typho-mal F.‡	23	15	21	31	22	26
24	Cer-spinal Men.	7	13	3	13	15	2	Cholera Morbus	12	13	16	13	17	7	Cer-spinal Men.	10	14	13	16	13	7
25	Cholera Morbus	11	11	18	12	11	10	Dysentery	12	11	14	14	7	14	Mem. Croup	18	11	16	21	25	14
26	Cholera Infantum	4	3	9	4	10	5	Cholera Infant.	4	5	8	4	4	1	Cholera Infant.	5	5	7	5	4	4
27	Small-pox	3	0	2	9	3	1	Small-pox	2	0	2	9	1	1	Small-pox	2	0	0	6	1	1
	Observers§	78	80	90	97	70	83	Observers§	79	80	90	100	70	87	Observers§	78	79	87	98	67	85

Line Number.	April.*							May.*							June.*						
	Diseases.	Av. '77-'84.	1884.	1883.	1882.	1881.	1880.	Diseases.	Av. '77-'84.	1884.	1883.	1882.	1881.	1880.	Diseases.	Av. '77-'84.	1884.	1883.	1882.	1881.	1880.
	Av. Disease†	42	43	45	42	47	41	Av. Disease†	41	40	45	43	44	40	Av. Disease†	40	39	41	41	45	46
1	Neuralgia‡	86	91	93	90	84	82	Neuralgia‡	82	89	86	91	81	75	Rheumatism	84	86	85	87	86	89
2	Rheumatism	88	88	93	85	93	84	Rheumatism	86	89	89	84	89	83	Neuralgia‡	81	81	85	83	78	81
3	Intermit'nt Fever	86	82	79	81	91	90	Intermit. Fever	91	81	85	87	94	93	Intermit'nt Fev'r	91	79	89	86	96	96
4	Bronchitis	84	82	85	90	88	80	Tonsilitis‡	72	80	78	72	60	65	Consumption‡	71	74	69	74	72	73
5	Tonsilitis‡	76	78	81	71	75	70	Bronchitis	79	76	89	86	80	74	Bronchitis	69	69	75	77	72	77
6	Consumption‡	76	76	71	78	79	78	Consumption‡	77	74	77	79	79	79	Tonsilitis‡	65	67	60	69	64	64
7	Pneumonia	77	69	75	81	79	86	Diarrhea	56	68	63	62	54	57	Diarrhea	65	65	69	61	80	78
8	Diarrhea	50	66	53	65	54	41	Influenza	55	55	64	55	49	46	Remit. Fever‡	65	50	59	60	65	77
9	Remittent Fever‡	61	65	55	64	62	61	Remit. Fever‡	64	53	56	65	67	69	Cholera Morbus	40	48	31	28	64	57
10	Influenza	65	60	73	60	66	57	Pneumonia	67	47	76	73	83	65	Erysipelas	42	48	50	41	42	49
11	Erysipelas	47	54	51	45	44	52	Erysipelas	48	47	54	49	40	58	Infl. of Kidney‡	..	43	..	..	..	..
12	Infl. of Kidney‡	..	47	..	..	..	..	Scarlatina	34	43	36	35	37	23	Influenza	41	38	48	53	30	34
13	Scarlatina	39	46	35	36	46	31	Infl. of Kidney‡	..	42	..	..	..	..	Pneumonia	46	33	43	57	54	47
14	Whooping-cough	..	31	24	21	22	45	Diphtheria	32	32	28	38	43	38	Whooping-cough	..	31	19	26	28	51
15	Diphtheria	38	28	32	43	49	43	Whoop-cough	..	31	30	25	26	51	Infl. of Bowels‡	28	30	31	21	30	28
16	Measles	36	26	56	22	81	54	Measles	41	30	71	37	80	49	Dysentery	27	27	32	16	36	35
17	Infl. of Bowels‡	23	26	32	23	16	20	Infl. of Bowels‡	25	26	31	21	20	28	Scarlatina	30	26	28	34	30	30
18	Typho-mal-Fev'r‡	21	22	22	28	18	14	Typho-mal-F.‡	22	22	31	23	24	14	Typho-mal-F.‡	24	25	26	21	19	30
19	Cer-spi-Men.	14	22	14	15	34	5	Cholera Morbus	20	18	24	16	29	16	Cholera Infant.	24	23	18	22	39	35
20	Dysentery	15	21	16	26	7	11	Dysentery	17	18	24	16	11	12	Diphtheria	29	21	28	33	45	32
21	Inflam. of Brain‡	14	15	15	15	15	12	Puerperal Fever	12	14	20	21	13	6	Measles	36	20	60	33	62	51
22	Puerperal Fever	9	15	13	9	9	7	Infl. of Brain‡	14	12	13	16	13	15	Puerperal Fever	12	15	13	25	12	14
23	Cholera Morbus	14	15	16	17	22	8	Mem. Croup	11	12	16	13	11	7	Infl. of Brain‡	12	12	11	16	7	12
24	Typhoid Fever	12	13	12	15	7	8	Cer-spi-Men.	11	12	11	14	26	7	Typhoid Fever	11	7	17	16	12	8
25	Cholera Infantum	5	12	9	2	0	1	Cholera Infant.	8	11	13	6	10	5	Cer-spi-Men.	9	7	10	14	20	4
26	Mem. Croup	15	10	19	14	13	13	Typhoid Fever	10	9	13	13	9	7	Mem. Croup	9	7	14	7	13	8
27	Small-pox	3	1	0	6	9	1	Small-pox	4	1	1	11	7	1	Small-pox	3	0	1	6	6	0
	Observers§	72	68	85	86	68	83	Observers§	75	74	87	95	70	81	Observers§	75	84	88	87	69	74

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* For 1884 the number of observers, reports, weeks in each month, etc., are stated in the first five columns of Exhibit II., page 96; the names of observers and the number of reports received from each are stated in Exhibit III., pages 114–116.

† The numbers in this line are an average, not for all diseases represented, but only for those reported present in the given month. ‡ See foot-note with this mark on page 97.

§ The numbers in this line state how many observers reported for the month in the given year.

Reported Present, by Months in each of the Years 1880–84.

Per Cents of Observers by whom Diseases were Reported Present.

July.*

Diseases.	Av. '77-'84.	1884.	1883.	1882.	1881.	1880.
Av. Disease†	43	45	42	41	46	47
Diarrhea	91	93	87	82	97	99
Intermitt. Fever	92	87	87	86	97	98
Neuralgia ‡	77	82	81	84	69	70
Rheumatism	77	79	80	84	80	83
Consumption ‡	71	74	68	77	74	74
Cholera Morbus	72	72	60	53	87	88
Remitt'nt Fever‡	71	66	58	67	71	74
Bronchitis	60	66	73	66	53	65
Tonsilitis ‡	54	61	66	61	43	45
Erysipelas	41	59	41	39	40	40
Dysentery	55	55	45	36	74	64
Cholera Infant	50	48	44	28	70	66
Influenza	33	39	35	31	19	26
Infl. of Kidney ‡	..	39	..	..	..	..
Whooping-cough	..	37	22	31	27	48
Infl. of Bowels ‡	34	36	27	32	39	36
Pneumonia	34	32	29	36	36	34
Typho-mal. F. ‡	29	28	24	22	27	39
Scarlatina	26	25	29	24	27	16
Diphtheria	29	20	26	31	43	36
Puerperal Fever	11	17	16	19	9	10
Measles	26	16	42	31	37	33
Inflam. of Brain‡	13	14	15	5	19	10
Typhoid Fever	14	13	13	15	21	18
Cer.-spi. Men	8	9	15	6	16	5
Mem. Croup	5	7	7	6	9	3
Small-pox	3	0	1	5	4	0
Observers §	77	87	95	88	70	80

August.*

Diseases.	Av. '77-'84.	1884.	1883.	1882.	1881.	1880.
Av. Disease†	44	39	48	45	48	48
Diarrhea	97	96	97	96	99	99
Intermitt. Fever	93	85	91	88	97	96
Rheumatism	73	81	76	79	82	75
Neuralgia ‡	74	74	82	82	67	70
Consumption ‡	68	73	64	73	72	73
Cholera Morbus	79	70	74	80	100	85
Dysentery	77	70	71	65	93	78
Remitt'nt Fever‡	75	64	62	69	76	80
Bronchitis	56	64	70	65	49	56
Cholera Infant	68	62	64	69	85	70
Tonsilitis ‡	53	57	63	60	39	50
Erysipelas	35	46	44	41	27	35
Influenza	35	40	36	35	28	41
Typho-mal. F. ‡	44	39	38	39	54	54
Infl. of Bowels ‡	35	36	43	30	34	30
Whooping-cough	..	35	23	31	28	50
Infl. of Kidney ‡	..	32	..	..	..	..
Diphtheria	31	24	30	33	48	31
Typhoid Fever	24	23	21	24	33	28
Pneumonia	27	21	39	29	27	29
Scarlatina	23	20	27	22	27	13
Infl. of Brain ‡	17	17	17	14	21	16
Puerperal Fever	11	17	19	17	13	8
Cer.-spi. Men	9	13	7	13	12	10
Measles	14	10	22	12	28	16
Mem. Croup	6	7	8	7	9	6
Small-pox	1	0	0	3	1	0
Observers §	79	84	98	101	67	80

September.*

Diseases.	Av. '77-'84.	1884.	1883.	1882.	1881.	1880.	Line Number.
Av. Disease†	46	46	46	48	46	49	
Diarrhea	96	94	95	95	97	99	1
Intermit. Fever	92	86	86	89	95	97	2
Neuralgia ‡	73	80	75	80	67	69	3
Dysentery	73	76	77	68	80	66	4
Rheumatism	75	75	75	77	76	78	5
Remit'nt Fever‡	77	74	67	77	77	79	6
Cholera Morbus	67	71	63	66	82	74	7
Consumption ‡	69	71	64	71	77	75	8
Cholera Infant	60	68	53	67	71	58	9
Tonsilitis ‡	58	65	67	59	45	58	10
Bronchitis	62	61	68	75	53	64	11
Typho-mal. F. ‡	69	50	51	56	74	71	12
Influenza	43	48	41	51	27	42	13
Erysipelas	31	41	34	34	26	32	14
Infl. of Bowels ‡	31	40	29	28	26	32	15
Infl. of Kidney ‡	..	31	..	..	..	..	16
Typhoid Fever	32	29	29	27	45	36	17
Whoop.-cough	..	28	22	30	23	48	18
Diphtheria	33	21	23	42	47	45	19
Pneumonia	32	19	39	35	32	38	20
Scarlatina	23	16	26	22	20	20	21
Infl. of Brain ‡	13	16	11	11	12	16	22
Puerperal Fever	11	16	10	19	11	8	23
Cer.-spi. Men	10	13	15	13	12	8	24
Mem. Croup	9	9	11	11	12	8	25
Measles	9	8	14	6	11	13	26
Small-pox	1	0	0	0	2	0	27
Observers §	77	80	92	96	66	77	

October.*

Diseases.	Av. '77-'84.	1884.	1883.	1882.	1881.	1880.
Av. Disease†	46	48	43	46	45	44
Diarrhea	80	91	73	87	85	72
Rheumatism	83	85	80	85	80	82
Intermitt. Fever	91	84	86	88	94	96
Neuralgia ‡	80	84	82	80	72	80
Consumption ‡	75	80	69	73	78	74
Tonsilitis ‡	67	73	70	73	52	64
Dysentery	49	73	40	48	57	30
Bronchitis	72	72	73	79	54	75
Remitt'nt Fever‡	75	70	60	74	75	74
Typho-mal. F. ‡	64	57	41	69	77	67
Cholera Morbus	35	55	31	35	45	25
Influenza	48	50	48	55	28	47
Erysipelas	41	50	51	44	35	41
Pneumonia	42	43	44	44	32	41
Cholera Infant	28	42	27	34	35	16
Infl. of Kidney ‡	..	42	..	..	..	..
Typhoid Fever	37	40	36	33	52	33
Infl. of Bowels ‡	29	34	35	34	25	17
Diphtheria	45	30	31	48	55	51
Whooping-cough	..	23	23	23	18	32
Scarlatina	28	18	26	32	15	20
Mem. Croup	14	15	11	21	15	14
Puerperal Fever	12	14	11	22	11	9
Cer.-spi. Men	10	11	11	8	17	9
Inflam. of Brain‡	11	11	9	11	18	16
Measles	8	7	18	8	8	11
Small-pox	1	9	0	2	0	0
Observers §	71	74	88	91	65	76

November.*

Diseases.	Av. '77-'84.	1884.	1883.	1882.	1881.	1880.
Av. Disease†	42	42	42	45	45	40
Neuralgia ‡	83	87	78	94	81	77
Rheumatism	84	83	78	88	84	84
Bronchitis	80	79	75	85	80	80
Tonsilitis ‡	76	79	75	82	77	73
Intermitt. Fever	86	74	75	85	96	89
Diarrhea	57	67	58	64	56	48
Consumption ‡	74	67	70	72	81	75
Remitt'nt Fever‡	66	58	55	67	73	61
Influenza	57	51	53	65	53	65
Typho-mal. F. ‡	49	45	40	57	76	39
Erysipelas	39	45	45	39	40	44
Pneumonia	59	45	57	65	59	64
Infl. of Kidney ‡	..	38	..	..	..	..
Typhoid Fever	32	33	23	41	46	31
Diphtheria	47	33	34	47	61	53
Dysentery	23	33	30	30	21	15
Infl. of Bowels ‡	27	27	30	31	30	17
Cholera Morbus	15	24	16	16	23	13
Mem. Croup	20	21	16	22	24	17
Whooping-cough	..	19	22	26	24	29
Cholera Infant	10	18	12	11	13	8
Scarlatina	30	17	34	31	20	28
Inflam. of Brain‡	12	14	16	11	12	9
Puerperal Fever	12	12	13	20	13	8
Cer.-spi. Men	7	9	10	11	14	4
Measles	11	6	22	14	6	13
Small-pox	2	0	0	2	6	1
Observers §	75	78	77	88	77	75

December.*

Diseases.	Av. '77-'84.	1884.	1883.	1882.	1881.	1880.	Line Number.
Av. Disease†	42	44	39	40	42	43	
Neuralgia ‡	84	90	79	88	81	84	1
Rheumatism	86	90	84	90	82	88	2
Bronchitis	84	83	76	82	82	83	3
Tonsilitis ‡	80	82	69	83	83	84	4
Intermit. Fever	79	74	75	71	82	83	5
Consumption ‡	73	69	69	70	74	77	6
Influenza	62	64	63	58	59	59	7
Remit'nt Fever‡	60	64	45	58	59	64	8
Pneumonia	70	61	65	67	65	77	9
Diarrhea	45	60	48	48	45	42	10
Erysipelas	41	45	37	40	53	52	11
Infl. of Kidney ‡	..	42	..	..	..	..	12
Typho-mal. F. ‡	38	39	27	37	60	32	13
Diphtheria	47	38	25	46	56	57	14
Infl. of Bowels ‡	26	34	25	33	24	16	15
Scarlatina	34	30	27	32	32	38	16
Mem. Croup	23	27	15	17	25	26	17
Whoop.-cough	..	25	27	23	18	28	18
Typhoid Fever	25	23	20	24	36	25	19
Cholera Morbus	13	23	19	15	11	17	20
Dysentery	15	19	19	12	8	10	21
Puerperal Fever	10	17	17	13	16	4	22
Cer.-spi. Men	8	14	5	6	14	4	23
Cholera Infant.	5	10	7	5	2	6	24
Infl. of Brain ‡	10	9	13	11	8	7	25
Measles	15	6	35	18	9	19	26
Small-pox	3	0	0	2	10	0	27
Observers §	76	77	75	84	88	69	

*, †, ‡. See notes with these marks on page 97.
§ For this foot-note see page 98.

TABLE 2.—WEEKLY REPORTS OF DISEASES IN MICHIGAN IN 1884.—*Exhibiting for the Year and for each Month of the Year Ending Saturday, January 3, 1885, a Summary relative to Diseases in the State of Michigan; also for each Month a Summary relative to Diseases in each of 11 Geographical Divisions* of the State,—Indicating the Prevalence as regards Time and Area. Compiled from 3,957 Weekly Reports by 142 Observers, Health Officers of Cities and Villages, and Regular Correspondents of the State Board of Health.*

Number of Observers, Reports, Etc.	Diseases.	(Av.b) Per Cent of Observers Reporting Presence of.	Av. Per Cent of Weeks Reported Present Where Present.c	Per Cent of Reports Stating Presence of.d	Average Order of Prevalence Where Present.e	Average Order of Prevalence where Present.							
						1883.	1882.	1881.	1880.	1879.	1878.	1877.	Av. '77-'84.
Year Ending January 3, 1885.† Average number of Localities represented, 119. Whole number of Observers during the year, 142. Average per month, 79. Total number of reports compiled, 3,957. Average per Month, 330.	Average for tabulated diseases reported present.	42	70	20	4.2	4.2	4.2	4.9	4.7	4.7	4.4	4.1	....
	Brain, Inflammation of	14	48	7	6.4	6.6	6.6	8.7	8.1	....	....	....	....
	Bowels, Inflammation of	30	55	17	5.8	6.1	6.0	7.4	7.0	....	....	....	....
	Bronchitis	74	82	61	3.2	3.2	3.8	3.9	3.7	3.6	3.3	2.3	3.3
	Cerebro-Spinal Meningitis	12	51	7	6.9	7.4	7.2	7.9	7.1	7.4	5.9	6.0	7.0
	Cholera Infantum	26	61	15	4.8	4.8	4.9	5.1	5.2	5.4	5.7	4.9	5.1
	Cholera Morbus	37	58	22	4.9	5.0	5.2	5.3	5.3	5.3	5.7	4.7	5.2
	Consumption, Pulmonary	72	87	63	4.3	4.5	4.6	5.6	5.7	5.6	5.2	5.1	5.1
	Croup, Membranous	14	46	6	7.1	7.1	7.0	8.2	7.4	6.6	7.1	6.1	7.1
	Diphtheria	27	53	15	5.1	5.4	4.8	5.6	5.7	5.4	5.4	5.3	5.3
	Diarrhea	71	73	52	3.3	3.7	3.8	3.9	4.2	4.4	4.2	3.8	3.9
	Dysentery	38	62	23	5.0	5.2	5.3	5.1	5.8	6.2	5.9	4.9	5.4
	Erysipelas	48	53	28	5.2	5.5	5.5	6.2	6.8	6.5	6.4	5.8	5.9
	Fever, Intermittent	79	82	65	2.5	2.8	2.0	2.4	2.3	2.2	2.1	2.2	2.3
	Fever, Remittent	60	73	41	3.3	3.3	3.3	3.5	3.8	3.8	3.1	3.1	3.8
	Fever, Typhoid (Enteric)	20	58	12	5.2	5.1	5.1	6.2	6.5	7.0	7.0	5.5	6.0
	Fever, Typho-Malarial	32	61	20	4.6	4.8	4.9	5.2	5.5	5.8	5.4	4.7	5.1

For the Whole number of Localities sented per month, 74. age number of observers Average No. of Reports	Influenza	53	77	41	3.3	3.2	3.1	3.5	3.0	3.1	3.1	3.0	8.2
	Kidney, Inflammation of	41	64	26	5.0	....	....	....	....	....	....	....	....
	Measles	17	55	10	5.2	3.7	4.9	4.4	4.8	4.7	5.3	5.0	4.8
	Neuralgia	84	83	70	3.3	3.3	3.6	4.3	4.5	4.5	....	....	....
	Pneumonia	48	59	29	4.5	4.7	4.4	5.4	5.1	5.2	4.8	4.0	4.8
	Puerperal Fever	16	45	7	6.9	7.3	6.2	8.2	7.8	7.2	6.3	6.1	7.0
	Rheumatism	83	84	70	3.6	3.7	3.8	4.6	4.6	4.6	4.2	4.0	4.1
	Scarlatina	29	56	16	5.2	5.2	4.9	6.7	6.5	5.5	5.4	4.8	5.5
	Small-pox *	0.1	33	0.1	26.0	14.0	9.1	8.9	6.3	10.6	3.9	6.8	10.7
	Tonsilitis	73	67	50	3.7	3.9	3.9	4.5	4.4	4.5	....	....	....
	Whooping-cough	29	69	23	4.5	5.2	4.4	6.3	5.5	4.7	4.8	5.1	5.1

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* For Counties in each Division, see Exhibit 1, page 93.

† For number of Observers, reports, weeks in each month, etc., see Exhibit II., page 96; for names of observers and number of reports received from each see Exhibit III, pages 114-116.

[a] Not every one of the observers sent in a report for every week, so that the number of reports received does not equal the number of observers multiplied by the number of weeks.

[b] The numbers in this column (pages 100-101) state not what per cent of the whole number of observers for the year reported the disease present at some time during the year, but the average (for the twelve months) of the per cents (of observers making reports for the several months) by which the disease was reported present in those months. The column for the year is thus a statement for an average *month*. But on pages 102-105 the numbers in the "Per Cent of Observers" column are statements for the month, and not averages. This column indicates the Area of Prevalence, except that in a few instances there were two or more observers in one city or village.

[c] This column states, for the year or given month, what per cent the number of reports which stated a disease to be present is of the number of card-reports received, for the given time, from such of the observers as reported the disease present. It is therefore an average not for all localities represented, but only for those at which the given disease was reported present. In the line "Average for Tabulated Diseases" it states what per cent the number of times *all* diseases were reported present is of the number of times they *might have been* so reported on the cards received, for the time specified, from the observers who during that time reported the diseases present (that is, if each of the observers had on every card he sent reported every disease present which he reported present at all). It will be seen that this is a more accurate average than would be obtained by dividing the sum of the column by the number of diseases reported present.

[d] This column states what per cent the number of reports stating presence of a disease is of the whole number of reports received for the time specified, from *all observers* in the State or Division, as the case may be. It combines, and states in a general way, an idea of the *time* a disease was prevalent, with an idea of the area of its prevalence. Had every observer sent a report every week of the month or year, the numbers in this column would be (for the State) the product of the numbers in the same line in the two preceding columns.

[e] The disease having the greatest number of cases was to be marked 1 in the order; the disease having the next greatest number of cases, 2; and so on. Diseases not present were to be marked 0. The numbers in this column are found by dividing the totals (for the State) of the Order of Prevalence column, in Table 3 (a table giving statements for each locality, omitted in printing this Report, for want of room), by the number of men who reported the disease present. The column is, therefore, an average not for all the localities represented, but only for those at which the given disease was reported present. The numbers in the "Average" lines for this column are found by dividing the sum of the totals in the Order of Prevalence columns, in Table 3, for all diseases reported present, by the sum of the numbers of men who reported the different diseases present, thus counting each man once for every disease he reported present. As a rule, small numbers in this column indicate a large prevalence of the disease, and *vice versa;* but the greater the number of diseases reported present by each observer from week to week, the greater will be the "average" in this column.

TABLE 2.—CONTINUED.—*Diseases in the State,—January to June, 1884. (For foot-notes and full tabular heads, see pages 100–101.)*

Months. †	Diseases.	Per ct. of Observers Reporting Pres. of. b	Av. per ct. of Weeks Reported Present where Present. a, c	Per cent of Reports Stating Pres. of. d	Av. Order of Prevalence where Pres. e	Months. †	Per ct. of Observers Reporting Pres. of. b	Av. per ct. of Weeks Reported Present where Present. a, c	Per. cent of Reports Stating Pres. of. d	Av. Order of Prevalence where Pres. e	Months. †	Per ct. of Observers Reporting Pres. of. b	Av. per ct. of Weeks Reported Present where Present a, c	Per cent of Reports Stating Pres. of. d	Av. Order of Prevalence where Pres. e
January. †	Av. for Tab. Dis. Rep. Pres.	43	67	29	4.1	February. †	40	72	29	4.2	March. †	41	73	30	4.3
	Brain, Inflammation of	19	39	7	5.4		14	50	7	7.7		16	44	8	5.5
	Bowels, Inflammation of	24	50	12	6.0		21	58	12	6.5		27	63	17	6.6
	Bronchitis	83	85	71	2.6		81	85	71	2.6		80	89	71	2.6
	Cerebro-spinal Meningitis	13	35	4	6.6		14	47	7	6.7		14	64	9	6.8
	Cholera Infantum	3	56	1	8.0		5	63	3	6.0		5	73	4	14.3
	Cholera Morbus	11	48	5	7.2		13	42	5	8.5		18	47	9	8.4
	Consumption, Pulmonary	65	85	56	4.5		65	93	61	4.6		75	87	66	4.3
	Croup, Membranous	19	37	7	6.2		19	58	10	6.4		11	46	5	8.6
	Diphtheria	35	50	17	5.1		20	64	13	5.9		25	64	16	5.3
	Diarrhea	51	54	28	4.6		48	57	27	4.9		46	58	26	4.8
	Dysentery	21	49	10	6.6		11	56	7	8.2		20	60	12	6.1
	Erysipelas	51	45	23	5.1		44	56	24	5.6		42	56	24	5.6
	Fever, Intermittent	71	79	56	2.9		65	56	56	3.1		73	78	57	2.9
	Fever, Remittent	58	67	38	3.5		53	77	40	3.7		53	74	40	3.6
	Fever, Typhoid (Enteric)	19	50	10	5.1		13	51	7	5.5		16	46	8	6.5
	Fever, Typho-malarial	25	53	14	5.4		19	60	12	3.9		15	81	13	5.7
	Influenza	69	80	55	2.5		64	80	51	2.4		61	82	50	2.7
	Kidney, Inflammation of	45	63	28	4.7		46	65	31	5.2		41	71	29	5.3
	Measles	26	59	16	4.9		29	56	16	4.7		25	54	14	4.9
	Neuralgia	84	83	69	3.1		84	87	73	3.2		84	88	74	3.1
	Pneumonia	79	69	54	3.8		73	67	49	3.8		63	68	43	4.2
	Puerperal Fever	8	46	8	6.1		16	55	9	7.0		18	53	10	6.6
	Rheumatism	81	80	65	3.6		81	81	67	3.6		82	84	70	3.7

	Scarlatina	34	59	19	4.9		40	61	25	4.8		39	72	28	4.4
	Small-pox	0	0	0	0		0	0	0	0		0	0	0	0
	Tonsilitis	79	66	53	3.6		79	74	59	3.4		77	72	56	3.4
	Whooping-cough	34	61	21	4.7		30	68	21	4.6		29	70	20	5.1
April. †	Av. for Tab. Dis. Rep. Pres	43	65	28	3.9	May. †	40	70	28	4.1	June. †	40	72	29	4.0
	Brain, Inflammation of	15	42	6	4.8		12	50	6	6.1		12	59	8	5.8
	Bowels, Inflammation of	26	44	11	5.4		26	47	12	6.0		30	59	18	5.4
	Bronchitis	82	79	65	2.9		76	79	59	3.1		69	81	56	3.3
	Cerebro-spinal Meningitis	22	45	10	4.9		12	53	6	7.3		7	71	6	7.8
	Cholera Infantum	12	51	6	7.1		11	52	5	7.4		23	63	14	5.6
	Cholera Morbus	15	40	6	6.5		18	43	7	6.5		48	53	26	4.5
	Consumption, Pulmonary	76	90	70	3.9		74	89	67	4.2		74	89	65	3.9
	Croup, Membranous	10	38	4	5.7		12	43	5	6.7		7	55	4	8.7
	Diphtheria	28	43	12	4.1		32	53	17	4.6		21	57	13	5.4
	Diarrhea	66	56	38	4.4		68	67	45	4.3		65	78	52	3.5
	Dysentery	21	46	10	6.1		18	64	11	7.5		27	62	17	5.9
	Erysipelas	54	44	25	5.0		47	57	27	5.0		48	51	24	4.5
	Fever, Intermittent	82	79	65	2.2		81	84	68	2.3		79	89	72	2.2
	Fever, Remittent	65	65	42	3.2		53	77	40	3.3		50	84	43	3.3
	Fever, Typhoid (enteric)	13	44	6	5.9		9	54	5	6.4		7	59	4	5.4
	Fever, Typho-malarial	22	49	11	4.1		22	54	12	4.5		26	49	12	4.9
	Influenza	60	80	49	2.8		55	74	42	3.3		38	76	30	4.4
	Kidney, Inflammation of	47	56	26	4.7		42	68	29	5.0		43	65	27	4.8
	Measles	26	55	14	3.9		30	60	17	4.4		20	59	13	4.9
	Neuralgia	91	83	76	3.2		89	83	74	3.1		81	83	67	2.9
	Pneumonia	69	55	39	3.7		47	51	24	4.6		33	53	18	5.1
	Puerperal Fever	15	44	6	6.6		14	45	6	7.5		15	47	7	5.4
	Rheumatism	88	85	75	3.4		89	85	77	3.3		86	86	73	3.1
	Scarlatina	46	48	22	4.2		43	57	25	4.8		26	51	14	5.2
	Small-pox	1	20	0.3	26.0		1	50	1	26.0		0	0	0	0
	Tonsilitis	78	66	53	3.3		80	65	52	3.6		67	67	45	3.7
	Whooping-cough	31	50	16	5.1		31	66	21	4.3		31	71	22	3.8

TABLE 2.—CONTINUED.—*Diseases in the State,—July to December, 1884. (For foot-notes and full tabular heads see pages 100–101.)*

Month.†	Diseases.	Per ct. of Observers Reporting Pres. of.[b]	Av. per ct. of Weeks Reported Present, **where** Present.[a, c]	Per cent. of Reports stating presence of.[d]	Av. order of prevalence, **where** Pres.[e]	Month.†	Per ct. of Observers Reporting Pres. of.[b]	Av. per ct. of Weeks Reported Present, **where** present.[a, c]	Per cent. of Reports stating Pres. of.[d]	Av. order of prevalence, **where** Pres.[e]	Month.†	Per ct. of Observers Reporting Pres. of.[b]	Av. per ct. of Weeks Reported Present, **where** present.[a, c]	Per cent. of Reports stating Pres. of.[d]	Av. order of Prevalence, **where** Pres.[e]
July.†	Average for Tab. Dis. Rep. Present	45	68	31	4.0	August.†	39	74	34	4.4	September.†	46	73	34	4.4
	Brain, inflammation of	14	57	8	5.6		17	49	9	6.8		16	46	8	7.1
	Bowels, inflammation of	36	57	20	5.2		36	63	24	5.4		40	63	25	5.7
	Bronchitis	66	74	49	3.9		64	77	47	4.3		61	81	50	4.4
	Cerebro-spinal Meningitis	9	55	5	8.9		13	54	10	7.9		13	56	7	6.8
	Cholera Infantum	48	62	29	3.8		62	71	43	3.5		68	69	47	4.1
	Cholera Morbus	72	60	44	3.8		70	75	52	3.8		71	71	51	4.2
	Consumption, Pulmonary	74	86	63	4.1		73	87	63	4.8		71	87	63	5.1
	Croup, Membranous	7	52	4	10.2		7	58	4	9.5		9	57	5	9.4
	Diphtheria	20	37	8	6.5		24	57	14	6.8		21	45	10	5.5
	Diarrhea	93	78	73	2.3		96	90	88	1.9		94	93	88	1.9
	Dysentery	55	64	36	4.3		70	72	50	4.0		76	78	60	3.8
	Erysipelas	59	47	28	5.0		46	60	28	5.5		41	57	24	5.9
	Fever, Intermittent	87	86	76	2.0		85	86	73	2.4		86	84	73	2.7
	Fever, Remittent	66	75	50	2.9		64	73	47	3.6		74	73	53	3.3
	Fever, Typhoid (enteric)	13	52	7	5.8		23	63	14	6.0		29	67	19	5.2
	Fever, Typho-malarial	28	51	14	4.8		39	58	23	5.1		50	64	33	4.5
	Influenza	39	67	27	4.3		40	73	47	4.7		48	72	34	4.4
	Kidney, Inflammation of	39	59	24	4.6		32	71	23	5.1		31	70	22	6.0
	Measles	16	34	5	5.1		10	45	4	7.4		8	59	4	6.7
	Neuralgia	82	82	68	3.5		74	87	64	4.2		80	78	63	4.1
	Pneumonia	32	49	16	4.9		21	53	11	6.2		19	53	10	6.5
	Puerperal Fever	17	36	6	7.3		17	48	8	7.2		16	42	7	7.6
	Rheumatism	79	84	67	3.7		81	83	68	4.2		75	89	67	4.5

	Scarlatina	25	47	12	4.8		20	58	12	6.4		16	51	9	6.0
	Small-pox	0	0	0	0		0	0	0	0		0	0	0	0
	Tonsilitis	61	60	38	4.2		57	67	38	4.9		65	59	39	4.8
	Whooping-cough	37	77	28	4.3		35	83	29	4.3		28	80	22	5.0
October.†	Av. for Tab. Dis. Reported Present	48	68	33	4.2	November.†	42	72	30	4.2	December.†	44	67	29	4.1
	Brain, Inflammation of	11	48	5	8.3		14	55	8	6.9		9	50	5	7.7
	Bowels, Inflammation of	34	49	17	6.2		27	62	17	5.9		34	48	16	5.5
	Bronchitis	72	78	56	3.7		79	85	68	3.0		83	86	70	2.8
	Cerebro-spinal Meningitis	11	48	5	6.1		9	39	4	9.3		14	57	8	6.5
	Cholera Infantum	42	53	22	4.9		18	38	7	7.4		10	30	3	5.6
	Cholera Morbus	55	51	29	4.5		24	49	12	5.7		23	38	9	7.4
	Consumption, Pulmonary	80	82	65	4.4		67	90	60	4.2		69	84	58	4.2
	Croup, Membranous	15	49	7	7.6		21	47	10	6.5		27	39	10	5.6
	Diphtheria	30	60	18	4.9		33	55	19	4.3		38	53	20	4.1
	Diarrhea	91	80	70	2.5		67	67	46	4.0		60	58	35	4.4
	Dysentery	73	60	44	4.6		33	44	15	5.7		19	43	8	6.6
	Erysipelas	50	58	27	5.4		45	63	28	5.1		45	58	26	5.4
	Fever, Intermittent	84	86	72	2.2		74	82	61	2.4		74	71	53	2.8
	Fever, Remittent	70	77	54	3.1		58	75	43	3.4		64	63	40	3.2
	Fever, Typhoid (enteric)	40	58	23	4.6		33	69	23	4.1		23	59	13	4.7
	Fever, Typho-malarial	57	69	39	4.1		45	72	33	4.2		39	59	23	4.7
	Influenza	50	72	37	3.7		51	79	41	3.2		64	78	49	2.8
	Kidney, Inflammation of	42	61	26	4.9		38	65	25	4.9		42	64	27	5.1
	Measles	7	60	4	7.6		6	60	4	9.0		6	63	4	9.0
	Neuralgia	84	81	68	9.8		87	84	73	2.9		90	82	73	2.8
	Pneumonia	43	49	21	5.3		45	63	29	5.2		61	56	34	4.7
	Puerperal Fever	14	43	6	7.0		12	50	6	8.9		17	39	7	5.9
	Rheumatism	85	79	67	3.7		83	84	70	3.4		90	85	76	3.3
	Scarlatina	18	51	9	5.6		17	58	10	7.4		30	50	15	6.5
	Small-pox	0	0	0	0		0	0	0	0		0	0	0	0
	Tonsilitis	73	65	48	4.0		79	73	58	3.5		82	70	57	3.0
	Whooping-cough	23	63	15	5.1		19	72	14	4.3		25	68	17	4.1

TABLE 2.—CONTINUED.—*Diseases in the U. P., the N., the W., and the B. and E., Divisions* of the State, for the Years 1877–84, and by Months† in 1884—Indicating what Per Cent of the Weekly Reports received stated Presence of the Diseases Named.*[a] (*Statements for the N. W. and the N. C. Divisions are on page 110.*

Div.*	Diseases.	'77–'84.‡	1884. †	Jan.†	Feb.†	March.†	April.†	May.†	June.†	July.†	Aug.†	Sept.†	Oct.†	Nov.†	Dec.†	Div.*	'77–'84.‡	1884. †	Jan.†	Feb.†	March.†	April.†	May.†	June.†	July.†	Aug.†	Sept.†	Oct.†	Nov.†	Dec.†
Upper Peninsular Division.*	Av. for Tab. Dis. Rep. Pr.	30	29	33	35	36	43	39	33	41	47	46	50	48	49	Northern Division.*	23	15	38	50	50	33	30	27	31	36	65	29	30	19
	Brain, Inflammation of	‡ 4	6	0	0	0	0	0	0	44	17	8	21	0	0		2	2	20	0	0	0	25	0	0	0	0	0	0	0
	Bowels, Inflammation of	‡ 21	21	0	16	30	7	9	0	11	33	50	43	33	15		4	7	0	0	0	0	25	17	30	0	0	10	0	0
	Bronchitis	73	91	85	84	90	79	91	100	78	92	100	100	100	100		62	26	40	0	0	20	0	0	20	0	0	50	58	33
	Cerebro-spinal Meningitis	2	2	5	0	0	0	0	0	0	0	17	0	0	0		3	1	0	0	0	0	25	0	0	0	0	0	0	0
	Cholera Infantum	14	13	0	0	0	0	0	0	33	83	67	0	0	0		4	7	0	0	0	0	0	0	10	29	0	10	8	7
	Cholera Morbus	17	10	0	0	0	0	0	17	11	67	50	7	0	0		4	4	20	0	0	0	0	0	10	14	0	0	0	0
	Consumption, Pulmonary	77	72	55	58	90	100	73	33	44	67	67	79	75	100		12	17	20	0	0	0	0	17	60	29	0	30	0	13
	Croup, Membranous	6	9	0	11	0	0	9	0	0	0	8	14	42	23		1	0	0	0	0	0	0	0	0	0	0	0	0	0
	Diphtheria	7	11	0	0	15	0	9	0	0	8	17	14	25	46		8	6	0	0	0	0	0	0	10	14	0	0	8	13
	Diarrhea	61	55	35	37	40	36	73	33	78	100	100	79	50	31		52	28	0	0	25	0	25	50	60	71	50	20	25	7
	Dysentery	26	25	20	0	15	0	0	0	22	83	92	50	8	23		32	13	0	0	0	0	0	17	50	71	....	0	0	0
	Erysipelas	26	21	5	21	20	14	18	17	0	17	17	50	25	46		9	14	0	0	25	0	0	0	10	43	50	30	17	0
	Fever, Intermittent	8	8	0	5	0	0	0	33	22	25	17	21	0	0		26	35	20	0	25	20	25	33	60	57	100	50	17	20
	Fever, Remittent	17	10	0	0	0	0	0	0	11	17	25	36	17	23		5	6	0	0	0	20	0	0	0	0	....	0	25	7
	Fever, Typhoid (enteric)	32	33	55	21	0	0	9	33	44	33	67	71	50	23		8	20	0	0	0	0	0	0	0	43	75	50	33	13
	Fever, Typho-malarial	5	0	0	0	0	0	0	0	0	0	0	0	0	0		14	15	60	50	0	0	25	17	10	29	50	10	0	0
	Influenza	51	41	45	26	30	36	27	0	0	17	33	71	75	100		43	13	0	0	100	0	25	0	0	0	0	20	33	0
	Kidney, Inflammation of	‡ 19	50	25	11	35	36	36	....	33	58	83	93	100	100		‡ 4	13	0	50	0	60	0	33	40	0	0	0	0	0
	Measles	19	1	0	0	5	0	0	0	0	0	0	0	0	0		18	0	0	0	0	0	0	0	0	0	0	0	0	0
	Neuralgia	‡ 54	52	20	68	40	36	46	67	56	67	83	50	67	54		70	40	60	25	100	40	75	0	30	0	0	60	42	47
	Pneumonia	41	30	5	37	45	50	0	17	0	8	8	57	42	62		26	20	80	25	0	40	25	0	50	14	0	20	0	7
	Puerperal Fever	5	11	0	26	20	0	0	0	11	25	8	0	8	23		11	10	20	75	50	0	0	33	0	14	0	0	0	0
	Rheumatism	67	65	60	74	65	64	64	100	78	50	58	71	58	54		72	24	40	0	0	20	25	50	30	0	0	10	42	33
	Scarlatina	32	13	15	11	10	0	18	0	22	25	0	21	17	15		4	8	0	50	25	0	0	0	20	0	0	0	0	13
	Small-pox	1	0	0	0	0	0	0	0	0	0	0	0	0	0		0	0	0	0	0	0	0	0	0	0	0	0	0	0

	Tonsilitis	‡ 44	56	55	63	45	29	64	67	78	67	58	50	75	46		26	31	0	75	0	40	0	17	30	43	0	30	50	40
	Whooping-cough	23	23	15	21	20	29	36	33	67	67	25	0	0	0		7	1	0	0	0	0	0	17	0	0	0	0	0	0
Western Division.*	Av. for Tab. Dis. Rep. Pr.	33	23	25	29	27	29	29	24	26	35	34	30	23	28	Bay and Eastern Division.*	36	37	43	42	39	30	38	41	41	39	44	40	38	38
	Brain, Inflammation of	‡ 5	3	5	0	3	0	4	4	2	13	0	0	4	0		‡ 7	15	17	12	11	3	7	14	17	14	18	14	25	22
	Bowels, Inflammation of	‡ 16	13	3	6	13	19	21	22	18	26	9	4	13	7		‡ 21	31	23	15	29	3	7	31	50	37	50	33	41	38
	Bronchitis	57	42	55	54	63	67	54	41	31	0	22	28	42	43		75	69	97	92	71	57	67	69	63	54	56	71	66	78
	Cerebro-spinal Meningitis	4	3	3	0	0	5	0	0	0	39	0	0	0	0		7	14	17	19	4	0	13	19	23	11	12	12	9	22
	Cholera Infantum	17	16	5	9	9	19	13	11	22	39	43	24	4	10		19	27	0	12	11	10	13	25	48	54	62	31	25	11
	Cholera Morbus	22	13	0	0	3	5	0	19	38	48	35	8	0	3		22	31	0	8	18	0	10	44	65	63	65	36	25	11
	Consumption, Pulmonary	49	37	33	34	44	19	13	19	40	43	61	56	33	50		74	81	97	100	100	90	83	86	81	63	76	74	69	62
	Croup, Membranous	7	1	3	0	3	5	0	0	0	0	0	0	4	0		12	17	33	35	14	3	13	14	15	11	15	17	16	19
	Diphtheria	31	8	10	0	0	10	8	4	7	4	4	24	13	13		32	24	37	54	36	30	43	28	10	9	6	24	19	14
	Diarrhea	47	41	30	26	13	33	21	15	71	74	74	64	29	40		52	58	20	35	32	47	53	69	79	91	91	64	41	49
	Dysentery	28	24	5	3	19	10	21	15	31	65	74	44	8	13		21	25	10	0	4	10	27	19	42	51	50	40	19	8
	Erysipelas	30	20	25	17	22	14	17	15	29	9	13	20	21	23		27	27	27	19	18	20	37	31	31	29	24	24	38	30
	Fever, Intermittent	76	62	60	49	59	62	71	59	71	78	65	60	58	53		84	68	57	46	64	63	83	81	79	71	74	69	75	49
	Fever, Remittent	68	57	53	51	47	81	54	63	60	61	61	72	42	53		51	48	47	50	43	33	40	42	58	54	65	45	41	46
	Fever, Typhoid (enteric)	12	2	5	0	0	0	0	0	2	0	0	4	4	3		9	17	13	4	14	3	0	0	17	26	41	38	22	19
	Fever, Typho-malarial	27	16	13	17	22	5	0	0	22	0	26	44	17	23		32	30	23	15	18	3	13	11	23	29	53	60	63	38
	Influenza	47	33	60	34	38	52	50	22	24	22	22	16	17	33		45	43	63	65	50	43	33	44	25	34	35	38	38	62
	Kidney, Inflammation of	‡ 20	20	20	20	13	24	17	22	13	17	17	12	42	30		‡ 30	38	47	50	46	20	27	14	29	31	24	29	31	24
	Measles	14	10	5	3	3	10	29	15	4	4	13	20	17	7		17	15	27	31	50	30	27	0	2	3	0	2	6	22
	Neuralgia	‡ 70	55	43	54	59	76	63	48	56	57	52	60	58	50		‡ 74	80	73	85	86	73	83	86	90	74	74	79	75	76
	Pneumonia	43	17	43	29	16	24	17	7	9	0	0	4	21	17		46	34	47	65	57	33	27	19	23	17	15	24	41	54
	Puerperal Fever	7	3	0	0	0	5	13	4	4	0	4	0	4	10		5	7	3	4	7	13	20	3	10	9	9	0	3	5
	Rheumatism	61	49	55	54	44	67	54	59	31	43	43	40	42	67		78	78	83	81	86	77	83	81	75	71	74	67	75	95
	Scarlatina	27	22	40	51	34	14	17	26	11	9	9	4	8	23		21	25	40	35	54	40	53	19	15	17	6	10	16	16
	Small-pox	1.1	0	0	0	0	0	0	0	0	0	0	0	0	0		1.5	0	0	0	0	0	0	0	0	0	0	0	0	0
	Tonsilitis	‡ 55	32	30	40	41	52	21	19	18	17	26	24	42	57		‡ 57	54	77	73	68	27	50	61	44	40	41	45	66	65
	Whooping-cough	17	5	10	57	0	0	0	0	11	0	0	0	13	10		27	53	53	42	36	10	43	64	63	60	74	55	59	57

*, †, d. See page 101. ‡ Inflammation of kidney was not compiled until 1884. For inflam. of brain, and inflam. of bowels, an average for the 5 years 1880-4; for neuralgia and tonsilitis, an av. for the 6 years 1879-84; for other diseases, and for the av. line, an av. for the 8 years 1877-84. For the northern division 1882-84.

TABLE 2.—CONTINUED.—*Diseases in the Central, the Southwestern, the Southern-Central, and the Southeastern Divisions* of the State, for the Years 1877–84, and by Months† in 1884,—Indicating what Per Cent of the Weekly Reports Received Stated Presence of the Diseases Named.*[a]

Div.*	Diseases.	'77-84.‡	1884.†	Jan.†	Feb.†	March.†	April.†	May.†	June.†	July.†	Aug.†	Sept.†	Oct.†	Nov.†	Dec.†	Div.*	'77-84.‡	1884.†	Jan.†	Feb.†	March.†	April.†	May.†	June.†	July.†	Aug.†	Sept.†	Oct.†	Nov.†	Dec.†
Central Division.*	Av. for Tab. Dis. Rep. Pr.	27	25	25	26	26	26	25	24	26	30	29	32	29	28	Southwestern Division.*	29	30	29	33	43	48	46	38	38	39	42	35	43	43
	Brain, Inflammation of	‡ 5	5	7	8	8	8	1	4	2	4	7	1	8	1		‡ 4	5	2	7	8	8	0	0	11	10	4	3	0	0
	Bowels, Inflammation of	‡ 11	13	13	13	13	15	10	10	8	14	11	16	13	12		‡ 9	9	5	0	4	13	5	9	17	20	18	6	5	0
	Bronchitis	53	58	65	66	68	61	48	49	49	42	46	56	66	73		53	58	68	57	79	75	37	30	42	50	46	52	77	88
	Cerebro-spinal Meningitis	4	6	1	5	9	11	9	7	1	1	7	10	3	6		2	1	2	0	0	0	0	0	0	3	0	0	0	0
	Cholera Infantum	11	9	0	1	0	1	1	8	18	23	35	18	6	1		21	17	0	0	0	0	0	13	36	53	61	15	0	4
	Cholera Morbus	15	16	5	7	9	8	7	26	30	26	28	24	14	9		15	20	7	4	0	0	0	17	42	53	71	15	5	4
	Consumption, Pulmonary	62	55	40	47	51	58	61	53	54	62	51	63	66	60		75	77	54	54	83	100	100	100	81	70	71	73	82	80
	Croup, Membranous	3	3	1	8	3	0	3	3	1	1	4	5	6	5		4	4	5	0	0	0	0	0	3	3	11	0	5	16
	Diphtheria	25	11	18	12	16	6	16	17	5	4	7	10	6	9		15	4	12	4	8	0	0	4	0	0	0	12	0	0
	Diarrhea	42	47	27	24	19	35	29	46	70	87	83	72	42	35		40	39	7	11	0	17	26	39	78	83	75	64	36	12
	Dysentery	15	17	7	4	8	5	6	11	24	38	58	41	6	2		14	17	5	0	0	0	0	13	28	37	46	36	18	4
	Erysipelas	17	21	17	18	4	19	23	15	17	28	18	24	36	32		21	29	20	18	25	25	21	39	50	33	29	21	27	36
	Fever, Intermittent	76	69	56	57	56	67	61	69	84	75	81	90	70	64		84	87	80	75	83	79	84	91	94	97	96	94	91	72
	Fever, Remittent	49	36	29	36	35	31	26	29	40	48	47	46	42	32		54	49	49	39	42	29	47	43	61	57	64	58	45	40
	Fever, Typhoid (enteric)	13	6	5	4	1	4	6	0	1	6	7	14	19	9		6	2	0	4	0	0	0	0	0	3	4	9	0	0
	Fever, Typho-malarial	20	17	12	16	7	11	14	13	10	26	21	35	30	15		21	15	12	4	17	0	0	4	8	20	29	33	18	24
	Influenza	36	41	51	46	43	38	30	22	33	29	39	41	48	60		45	56	71	68	71	67	42	39	42	57	36	48	55	72
	Kidney, Inflammation of	‡ 23	23	33	37	25	19	25	17	17	26	13	16	17	26		‡ 11	11	10	11	17	13	5	17	11	3	7	12	9	16
	Measles	11	7	12	25	12	12	10	7	1	0	1	0	0	0		11	5	2	21	14	0	0	0	11	7	0	6	0	0
	Neuralgia	‡ 58	67	64	66	73	79	65	56	60	64	58	68	78	79		‡ 75	86	93	79	88	79	95	91	83	83	75	79	95	92
	Pneumonia	35	27	50	45	52	40	33	10	8	7	3	15	20	26		32	26	59	50	50	29	21	22	8	10	7	6	18	28
	Puerperal Fever	5	5	7	4	8	5	0	3	5	4	4	9	5	4		2	2	7	11	0	0	0	0	0	0	7	0	0	0
	Rheumatism	59	65	56	62	69	63	68	61	63	72	64	68	66	70		74	81	63	54	58	100	100	100	86	83	93	70	100	92
	Scarlatina	14	9	12	20	16	12	6	6	6	6	10	3	3	2		14	8	2	18	29	29	0	9	3	0	0	0	0	20
	Small-pox	0.5	0	0	0	0	0	0	0	0	0	0	0	0	0		0.7	0	0	0	0	0	0	0	0	0	0	0	0	0

	Tonsilitis	‡ 39	40	45	43	40	37	46	28	30	25	29	47	56	52		‡ 43	53	56	79	79	75	37	57	25	40	46	45	45	68
	Whooping-cough	19	14	6	13	12	18	20	21	24	25	10	4	3	10		16	17	15	21	25	29	21	17	19	20	29	6	0	0
Southern Central Division.*	Av. for Tab. Dis. Rep. Pr.	30	34	32	32	34	33	32	37	36	37	40	42	34	33	Southeastern Division.*	37	35	43	43	48	34	35	35	33	36	36	33	34	33
	Brain, Inflammation of	‡ 3	4	4	3	2	1	5	8	3	6	4	3	8	3		‡ 17	20	26	32	32	26	30	25	21	12	13	13	11	11
	Bowels, Inflammation of	‡ 13	20	10	14	23	8	14	25	23	29	36	21	15	25		‡ 23	23	32	32	29	14	15	19	26	31	33	13	23	16
	Bronchitis	67	65	72	78	74	64	69	68	56	56	57	60	63	68		69	68	79	93	89	71	70	56	45	52	53	48	91	86
	Cerebro-spinal Meningitis	4	5	1	5	13	7	3	2	3	13	9	0	2	6		8	18	18	18	43	37	15	11	11	10	13	13	14	25
	Cholera Infantum	11	16	0	0	0	3	3	21	32	46	51	28	6	1		17	20	9	11	18	14	15	17	34	38	50	25	9	0
	Cholera Morbus	19	26	1	3	5	4	6	27	56	71	70	45	15	9		24	32	26	18	29	20	19	25	53	57	53	35	17	18
	Consumption, Pulmonary	63	66	64	66	60	71	74	73	68	63	73	72	58	53		84	82	88	93	93	89	93	97	79	81	70	68	74	73
	Croup, Membranous	4	2	3	3	2	1	2	0	0	0	0	3	11	5		14	15	21	14	29	17	15	14	11	10	13	15	17	14
	Diphtheria	16	13	10	5	5	4	5	0	8	13	22	24	35	27		35	38	56	43	64	46	41	31	21	40	20	28	34	41
	Diarrhea	45	61	31	19	29	43	58	73	80	90	99	93	56	54		54	49	35	36	36	26	30	42	62	88	100	73	34	16
	Dysentery	17	26	9	8	13	12	9	24	38	49	69	53	18	9		28	28	29	29	29	14	19	11	30	43	53	43	23	14
	Erysipelas	20	24	26	31	32	32	22	17	23	21	21	28	18	18		35	37	44	50	57	29	37	36	43	40	37	33	20	23
	Fever, Intermittent	82	75	64	72	68	81	82	83	86	75	84	83	63	65		76	55	50	61	57	54	56	67	64	71	47	48	49	34
	Fever, Remittent	57	59	51	53	58	60	60	60	71	52	55	71	55	63		48	37	32	29	54	43	26	33	30	26	50	53	49	30
	Fever, Typhoid (enteric)	10	14	9	11	13	9	2	0	6	16	25	29	32	15		26	23	21	14	36	17	30	22	13	21	20	25	34	23
	Fever, Typho-malarial	19	20	12	6	10	13	9	13	9	24	31	37	42	35		29	16	6	0	14	3	0	14	9	21	37	40	37	11
	Influenza	37	48	55	56	61	64	60	49	35	32	37	43	42	44		48	38	65	86	75	43	30	17	15	24	27	20	37	41
	Kidney, Inflammation of	‡ 25	25	22	27	27	33	34	38	27	13	19	21	23	22		‡ 26	26	35	36	29	14	30	39	28	24	20	15	17	32
	Measles	12	12	29	14	11	21	25	29	6	5	4	0	3	0		20	4	32	18	29	26	26	19	13	14	13	13	11	11
	Neuralgia	‡ 68	82	90	91	90	88	82	76	86	71	69	81	76	81		‡ 59	58	74	71	86	66	67	61	47	45	37	33	60	59
	Pneumonia	37	35	65	56	44	43	18	19	19	16	15	27	40	47		48	34	71	50	39	46	26	31	28	14	13	30	31	32
	Puerperal Fever	3	6	5	8	6	1	2	2	5	11	7	8	6	6		10	20	35	25	32	23	22	33	11	14	17	15	11	16
	Rheumatism	69	77	71	73	82	76	82	76	80	76	73	85	77	78		75	76	85	86	93	89	85	78	72	64	57	60	74	82
	Scarlatina	16	19	18	17	24	31	38	16	14	14	9	13	11	19		31	23	29	29	43	23	33	22	19	14	13	13	17	27
	Small-pox	0.7	0	0	0	0	0	0	0	0	0	0	0	0	0		5	1	0	0	0	3	7	0	0	0	0	0	0	0
	Tonsilitis	‡ 50	61	60	70	68	63	63	49	50	43	51	61	79	71		‡ 49	48	56	61	54	51	59	50	38	45	33	48	40	48
	Whooping-cough	19	15	23	14	21	13	20	13	19	30	12	5	0	9		30	36	53	46	50	20	19	28	43	21	30	40	40	39

*, +, d. See page 101. ‡ For inflam. of brain and inflam. of bowels, an av. for the 5 years 1880-4; for neuralgia and tonsilitis an av. for the 6 years 1879-84; inflammation of kidney for one year 1884; for other diseases and for av. line an av. for the 8 years 1877-84.

TABLE 2.—CONTINUED.—*Diseases in the Northwestern Division* for the Years 1879-84, and by Months† in 1884, and in the Northern-Central Division* for the Years 1880-84, and by Months† in 1884. Indicating on what Per Cent. of the Weekly Reports Received the Diseases Named were Reported Present.* [d]

Div.*	Diseases.	'79-84‡	1884.†	Jan.†	Feb.†	March.†	April.†	May.†	June.†	July.†	Aug.†	Sept.†	Oct.†	Nov.†	Dec.†
Northwestern Division.*	Av. for Tab. Dis. Rep. Pr.	34	33	62	53	52	44	37	35	36	36	40	36	39	34
	Brain, Inflammation of	‡3	5	0	0	0	0	6	0	6	20	19	5	0	0
	Bowels, Inflammation of	‡9	10	0	0	0	13	6	13	6	20	25	5	19	11
	Bronchitis	62	47	80	40	55	60	44	63	33	27	25	40	56	58
	Cerebro-spinal Meningitis	3	4	0	0	0	0	6	0	6	13	6	5	0	5
	Cholera Infantum	24	17	0	0	0	7	6	19	28	47	50	25	0	5
	Cholera Morbus	24	22	0	0	0	7	19	6	33	47	50	40	13	21
	Consumption, Pulmonary	35	48	100	80	73	67	44	31	56	40	31	45	31	21
	Croup, Membranous	8	7	0	50	0	0	0	0	0	0	0	10	0	26
	Diphtheria	20	12	10	0	18	7	19	25	0	27	0	5	13	21
	Diarrhea	62	63	40	30	36	47	75	56	83	93	88	75	81	21
	Dysentery	31	35	40	20	18	20	0	31	72	67	63	55	25	0
	Erysipelas	38	31	60	30	55	40	50	13	17	13	31	20	38	32
	Fever, Intermittent	83	85	100	100	91	93	75	94	89	87	88	85	69	68
	Fever, Remittent	38	39	10	30	0	40	31	44	44	60	56	55	38	32
	Fever, Typhoid (enteric)	10	15	0	0	0	13	6	19	11	7	13	25	31	37
	Fever, Typho-malarial	34	46	60	60	36	47	44	31	30	40	69	55	44	32
	Influenza	47	52	90	60	73	67	63	31	28	27	56	50	50	58
	Kidney, Inflammation of	‡48	48	50	40	73	47	56	38	44	40	50	80	31	32
	Measles	18	6	10	10	0	0	13	19	0	0	13	10	0	0
	Neuralgia	73	68	90	80	36	53	69	69	61	40	63	75	88	69
	Pneumonia	37	38	100	80	64	40	31	44	28	20	19	10	38	37
	Puerperal Fever	6	6	0	0	9	0	6	6	11	7	6	0	13	11
	Rheumatism	74	65	70	60	73	87	81	56	61	53	63	50	56	79
	Scarlatina	27	35	60	50	36	33	38	31	28	33	31	40	38	21
	Small-pox	2	0	0	0	0	0	0	0	0	0	0	0	0	0
	Tonsilitis	59	53	80	60	91	100	69	63	44	27	19	30	44	47
	Whooping-cough	25	25	70	70	45	33	31	13	11	20	25	10	6	16

Diseases.	Div.*	'80-84.‡	1884.†	Jan.†	Feb.†	March.†	April.†	May.†	June.†	July.†	Aug.†	Sept.†	Oct.†	Nov.†	Dec.†
Av. for Tab. Dis. Rep. Pr.	Northern-Central Division.*	29	30	26	40	28	49	50	49	34	45	47	33	38	33
Brain, Inflammation of		2	0	0	0	0	0	0	0	0	0	0	0	0	0
Bowels, Inflammation of		5	2	0	0	0	0	13	0	0	0	0	7	0	7
Bronchitis		48	48	50	50	33	75	63	63	43	50	50	36	50	43
Cerebro-spinal Meningitis		10	6	10	38	0	25	0	0	14	0	0	0	0	0
Cholera Infantum		12	12	0	0	0	0	0	0	29	50	25	36	0	0
Cholera Morbus		18	20	0	13	8	0	0	25	36	38	50	36	17	14
Consumption, Pulmonary		29	44	30	50	33	63	75	50	36	50	50	36	42	36
Croup, Membranous		11	14	30	4	0	38	13	0	7	13	0	7	0	29
Diphtheria		41	16	0	0	0	25	38	0	7	0	0	36	33	36
Diarrhea		46	51	30	50	33	63	63	63	50	75	50	57	58	36
Dysentery		19	23	0	0	0	13	0	38	50	38	38	43	25	14
Erysipelas		32	29	10	13	17	50	50	63	50	38	25	14	8	29
Fever, Intermittent		66	59	30	50	33	63	100	63	43	88	75	64	67	57
Fever, Remittent		58	53	40	50	33	75	88	75	43	50	63	64	42	43
Fever, Typhoid (enteric)		12	6	10	0	0	13	0	0	0	13	0	7	25	0
Fever, Typho-malarial		33	41	10	13	33	50	38	38	50	63	75	36	50	43
Influenza		11	9	0	0	0	25	25	0	0	13	13	14	8	14
Kidney, Inflammation of		‡2	2	0	0	8	0	0	0	0	0	0	7	0	7
Measles		21	5	0	0	0	0	25	13	21	0	0	0	0	0
Neuralgia		51	53	30	50	33	88	88	88	43	50	63	50	42	50
Pneumonia		33	17	20	63	25	0	13	13	14	13	0	29	17	0
Puerperal Fever		5	6	0	0	0	0	0	13	14	0	0	14	17	0
Rheumatism		54	59	40	50	25	88	75	88	43	50	50	64	75	71
Scarlatina		11	13	0	25	58	50	38	0	0	0	0	0	0	0
Small-pox		1	0	0	0	0	0	0	0	0	0	0	0	0	0
Tonsilitis		57	50	30	50	33	75	50	75	36	50	50	57	67	43
Whooping-cough		13	25	0	0	8	13	0	25	57	75	25	21	33	29

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*, †, [d]. For these references see foot-notes on page 101. ‡ Inflammation of Brain and Bowels,—Av. for only the 5 years 1880-84, Inflammation of Kidney for one year, 1884, Northwestern Division for 6 years, 1879-84, and Northern-Central for 5 years, 1880-84.

TABLE 2.—CONTINUED.—*Diseases in Northeastern Division* of the State for the years 1883-84, and by Months† in 1884. Indicating on what Per Cent of the Weekly Reports received the Diseases Named were Reported Present.*[4]

Div.*	Diseases.	Northeastern Division.*													
		1879-84‡	'884†.	Jan.†	Feb.†	Mar.†	Apr.†	May.†	June.†	July.†	Aug.†	Sept.	Oct.†	Nov.†	Dec.†
Northeastern Division.*	Av. for Tabulated Dis. Reported Present	36	35	54	51	53	52	56	55	64	55	59	52	49	37
	Brain, Inflammation of	3	3	0	0	13	0	0	0	0	0	0	0	10	7
	Bowels, Inflammation of	25	18	30	13	13	10	25	25	22	27	0	10	30	13
	Bronchitis	92	96	100	100	100	100	100	88	100	73	100	100	90	100
	Cerebro-spinal Meningitis	4	4	0	0	0	20	0	0	0	18	0	0	0	7
	Cholera Infantum	15	12	0	0	0	40	0	0	22	64	13	0	0	0
	Cholera Morbus	20	23	0	0	13	10	13	38	56	91	38	20	0	0
	Consumption, Pulmonary	80	74	50	75	100	80	50	63	67	91	75	80	90	67
	Croup, Membranous	15	11	10	13	0	0	25	0	0	27	0	30	10	13
	Diphtheria	3	6	0	0	0	0	0	0	0	45	0	0	0	13
	Diarrhea	84	82	70	100	100	100	100	88	89	100	100	80	50	40
	Dysentery	35	42	0	13	38	40	50	25	89	100	63	60	10	20
	Erysipelas	28	37	30	25	25	20	25	50	22	55	38	50	70	33
	Fever, Intermittent	12	11	0	0	13	10	25	0	0	27	0	0	30	20
	Fever, Remittent	40	37	50	50	38	30	25	50	44	55	50	40	20	13
	Fever, Typhoid (enteric)	6	5	0	0	0	0	0	0	0	27	25	0	0	7
	Fever, Typho-malarial	15	16	10	0	0	30	25	13	0	27	13	40	0	20
	Influenza	29	29	20	25	0	50	50	25	22	36	25	10	40	33
	Kidney, Inflammation of	‡80	80	90	100	100	90	100	100	78	73	75	100	60	33
	Measles	14	3	20	13	13	0	0	0	0	0	0	0	0	0
	Neuralgia	95	94	80	88	100	100	100	75	100	100	100	90	100	93
	Pneumonia	42	36	70	38	38	60	38	13	0	0	50	40	20	53
	Puerperal Fever	5	4	0	13	13	20	0	0	0	9	0	0	0	0
	Rheumatism	91	95	100	100	88	80	100	100	100	91	100	100	90	93
	Scarlatina	12	3	0	0	0	0	0	0	0	27	0	0	0	0
	Small-pox	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Tonsilitis	87	82	100	88	100	90	100	75	89	73	75	80	60	67
	Whooping-cough	8	7	40	25	0	0	0	0	0	18	0	0	0	0

*, †, [4] For these references see foot-notes on page 101.

‡ Northeastern Division for only two years, 1883-84. Inflammation of kidney for one year, 1884.

TABLE 4.—*A Summary for the Year 1884, relative to Diseases in each of the Eleven Divisions of the State,†—indicating the prevalence as regards both Time and Area.*

Diseases.	Western Division.*				Bay and Eastern.*				Central Division.*				Southwestern Div.*				S. Central Div.*				Southeastern Div.*			
	Per Cent of Observers Reporting Presence of.b	Av. Per Ct. of Weeks Reported Present where Present.c	Per Cent of Reports Stating Pres. of.d	Av. Order of Prevalence where Pres.e	Per Cent of Observers Reporting Presence of.b	Av. Per Ct. of Weeks Reported Present where Present.c	Per Cent of Reports Stating Pres. of.d	Av. Order of Prevalence where Pres.e	Per Cent of Observers Reporting Presence of.b	Av. Per Ct. of Weeks Reported Present where Present.c	Per Cent of Reports Stating Pres. of.d	Av. Order of Prevalence where Pres.e	Per Cent of Observers Reporting Presence of.b	Av. Per Ct. of Weeks Reported Present where Present.c	Per Cent of Reports Stating Pres. of.d	Av. Order of Prevalence where Pres.e	Per Cent of Observers Reporting Presence of.b	Av. Per Ct. of Weeks Reported Present where Present.c	Per Cent of Reports Stating Pres. of.d	Av. Order of Prevalence where Pres.e	Per Cent of Observers Reporting Presence of.b	Av. Per Ct. of Weeks Reported Present where Present.c	Per Cent of Reports Stating Pres. of.d	Av. Order of Prevalence where Pres.e
Average for Tabulated Diseases Reported Present	34	67	23	3.7	49	74	39	5.0	34	64	26	3.3	40	75	30	3.9	45	75	34	4.1	48	73	35	5.7
Brain, Inflammation of	8	31	3	4.6	27	52	15	7.5	14	36	5	3.8	10	52	5	5.6	10	39	4	6.5	24	82	20	12.2
Bowels, Inflammation of	21	55	13	5.7	43	71	31	7.0	27	45	13	4.3	23	39	9	4.9	33	61	20	5.7	31	77	23	9.6
Bronchitis	58	79	42	3.5	79	87	69	3.7	74	77	58	3.3	74	78	58	4.2	75	87	65	3.2	82	83	68	2.5
Cerebro-spinal Meningitis	2	46	3	4.0	19	68	14	7.3	14	38	6	3.2	2	29	1	6.5	12	44	5	5.7	21	83	18	15.4
Cholera Infantum	25	69	16	4.5	38	71	27	5.8	20	46	9	4.5	26	65	17	3.9	25	67	16	3.9	32	67	20	7.3
Cholera Morbus	26	51	13	4.1	46	68	31	5.7	30	53	16	4.6	33	62	20	3.9	43	60	26	4.2	52	61	32	6.8
Consumption, Pulmonary	45	84	37	4.7	87	93	81	4.3	67	81	55	3.7	81	93	77	5.2	73	90	66	5.1	88	94	82	3.1
Croup, Membranous	5	25	1	5.0	27	59	17	8.1	10	31	3	4.1	9	39	4	5.3	8	31	2	5.7	21	71	15	12.9
Diphtheria	20	36	8	3.6	40	57	24	6.4	24	45	11	4.4	10	37	4	5.6	22	59	13	4.4	54	69	38	5.4
Diarrhea	53	76	41	2.9	70	82	58	3.7	69	67	47	2.9	54	73	39	3.7	78	78	61	3.3	71	69	49	4.4
Dysentery	39	61	24	3.8	42	60	25	5.7	31	55	17	3.6	32	55	17	4.5	37	68	26	4.7	42	66	28	9.3
Erysipelas	42	47	20	5.0	53	51	27	6.3	41	49	21	3.8	54	54	29	4.4	42	57	24	5.7	58	63	37	6.8
Fever, Intermittent	74	83	62	2.0	82	83	68	2.7	84	81	69	2.2	96	90	87	2.2	86	87	75	2.8	69	78	55	3.3
Fever, Remittent	71	83	57	2.5	59	81	48	4.8	56	64	36	2.6	62	80	49	3.2	74	79	59	3.5	59	62	37	3.6
Fever, Typhoid (enteric)	6	26	2	4.4	30	58	17	5.3	13	44	6	3.6	6	33	2	6.8	21	67	14	5.0	37	60	23	7.2
Fever, Typho-malarial	25	62	16	3.3	44	70	30	5.8	29	56	17	3.9	26	58	15	4.8	29	68	20	5.8	30	54	16	4.0
Influenza	45	73	33	2.9	51	82	43	4.8	55	71	41	2.9	65	85	56	2.9	59	81	48	2.9	50	74	38	4.7
Kidney, Inflammation of	31	64	20	4.8	42	70	30	6.9	44	52	23	3.8	21	56	11	5.6	37	66	25	4.5	42	66	26	8.0
Measles	20	49	10	3.1	24	56	15	6.3	12	58	7	2.9	11	39	5	3.7	24	54	12	4.1	25	71	4	10.5
Neuralgia	69	80	55	3.7	90	89	80	3.6	82	82	67	2.7	96	89	86	3.2	91	89	82	3.2	76	75	58	3.8
Pneumonia	38	43	17	4.0	51	63	34	6.0	48	54	27	3.7	37	67	26	4.6	50	68	35	4.6	50	67	34	5.0
Puerperal Fever	9	39	3	5.5	19	37	7	8.4	13	39	5	4.0	5	57	2	5.0	14	39	6	5.9	30	69	20	11.8
Rheumatism	64	79	49	4.1	89	87	78	4.3	83	78	65	2.9	90	91	81	3.9	84	90	77	3.5	87	88	76	3.8
Scarlatina	41	55	22	3.4	39	62	25	5.1	21	42	9	4.2	20	41	8	3.4	36	52	19	5.8	28	79	23	7.8
Small-pox	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	33	1	26.0
Tonsilitis	52	61	32	4.4	74	70	54	4.7	71	56	40	3.6	73	72	53	4.2	76	79	61	3.5	81	59	48	3.0
Whooping-cough	9	50	5	4.5	67	76	53	4.3	21	62	14	3.3	23	71	17	3.5	22	69	15	5.0	47	74	36	6.2

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* For counties in each division see Exhibit 1, page 93. b, c, d, e, See foot-notes with these marks, in Table 2, page 101.

† This page includes the Six Divisions of the State from which the most Weekly Reports were received.

TABLE 4.—CONTINUED.†

Diseases.	Upper Peninsular Div.*				Northwestern Div.*				Northern Div.*				Northeastern Div.*				Northern Central Div.*			
	Per Cent of Observers Reporting Presence of.[b]	Av. Per Ct. of Weeks Reported Present **where** Present.[c]	Per Cent of Reports Stating Pres. of.[d]	Av. Order of Prevalence **where** Pres.[e]	Per Cent of Observers Reporting Presence of.[b]	Av. Per Ct. of Weeks Reported Present **where** Present.[c]	Per Cent of Reports Stating Pres. of.[d]	Av. Order of Prevalence **where** Pres.[e]	Per Cent of Observers Reporting Presence of.[b]	Av. Per Ct. of Weeks Reported Present **where** Present.[c]	Per Cent of Reports Stating Pres. of.[d]	Av. Order of Prevalence **where** Pres.[e]	Per Cent of Observers Reporting Presence of.[b]	Av. Per Ct. of Weeks Reported Present **where** Present.[c]	Per Cent of Reports Stating Pres. of.[d]	Av. Order of Prevalence **where** Pres.[e]	Per Cent of Observers Reporting Presence of.[b]	Av. Per Ct. of Weeks Reported Present **where** Present.[c]	Per Cent of Reports Stating Pres. of.[d]	Av. Order of Prevalence **where** Pres.[e]
Average for Tabulated Diseases Reported Present	41	71	29	4.2	52	63	33	4.1	21	47	15	2.0	50	70	35	4.1	41	63	30	4.5
Brain, Inflammation of	13	45	6	6.8	16	33	5	1.9	10	22	2	1.0	11	23	3	3.3	0	0	0	0
Bowels, Inflammation of	33	64	21	5.2	26	40	10	4.0	20	20	7	2.3	63	28	18	5.2	10	21	2	1.7
Bronchitis	100	91	91	2.6	70	65	47	3.4	40	58	26	1.5	100	96	96	2.4	60	80	48	3.0
Cerebro-spinal Meningitis	5	33	2	6.0	16	24	4	4.6	5	25	1	2.0	11	38	4	5.3	17	36	6	6.6
Cholera Infantum	18	72	13	3.4	33	52	17	3.9	30	23	7	1.8	26	48	12	5.3	23	47	12	5.6
Cholera Morbus	18	57	10	4.0	44	48	22	3.3	15	21	4	2.7	48	48	23	5.6	40	50	20	6.3
Consumption, Pulmonary	82	89	72	3.0	63	74	48	6.2	40	42	17	2.1	93	81	74	5.5	47	89	44	5.6
Croup, Membranous	18	54	9	6.9	14	46	7	2.7	0	0	0	0	33	33	11	6.1	33	38	14	7.1
Diphtheria	23	50	11	5.3	33	37	12	7.8	20	28	6	2.3	15	41	6	4.0	33	47	16	4.9
Diarrhea	82	67	55	3.2	88	71	63	3.3	60	45	28	1.7	96	85	82	3.1	73	67	51	3.4
Dysentery	36	69	25	3.9	56	63	35	4.2	20	79	13	1.8	67	63	42	5.8	33	64	23	4.6
Erysipelas	41	53	21	6.1	70	43	31	5.1	30	46	14	3.3	67	61	37	3.9	57	49	29	6.2
Fever, Intermittent	18	45	8	4.7	98	87	85	1.9	65	54	35	1.8	30	41	11	3.3	77	78	59	2.3
Fever, Remittent	15	64	10	4.8	67	56	39	4.2	15	36	6	2.3	52	74	37	3.0	67	80	53	2.2
Fever, Typhoid (enteric)	41	79	33	4.0	26	57	15	5.0	25	77	20	1.6	15	38	5	7.5	17	32	6	5.6
Fever, Typho-malarial	0	0	0	0	70	64	46	3.8	40	37	15	1.9	30	51	16	4.1	70	57	41	5.4
Influenza	49	80	41	2.6	65	80	52	3.3	20	65	13	1.0	41	69	29	3.1	23	33	9	4.4
Kidney, Inflammation of	56	83	50	5.3	72	67	48	4.8	20	69	13	1.8	93	86	80	4.3	10	21	2	2.3
Measles	3	25	1	5.0	16	37	6	6.4	0	0	0	0	11	31	3	3.3	10	46	5	7.3
Neuralgia	74	70	52	3.4	81	81	68	4.1	65	57	40	1.9	100	94	94	3.4	77	69	53	3.8
Pneumonia	51	57	30	5.1	70	53	38	3.7	40	46	20	2.0	67	53	36	5.4	40	41	17	5.9
Puerperal Fever	23	50	11	7.3	23	25	6	4.4	25	45	10	2.0	15	31	4	6.0	13	44	6	6.8
Rheumatism	92	71	65	4.4	86	75	65	3.8	50	49	24	2.0	100	95	95	3.6	73	80	59	3.6
Scarlatina	28	45	13	7.3	47	72	35	5.1	20	39	8	1.8	4	100	3	9.0	20	67	13	6.5
Small-pox	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Tonsilitis	77	72	56	4.4	77	68	53	3.6	65	48	31	2.2	100	82	82	3.1	63	78	50	4.3
Whooping-cough	28	84	23	3.6	44	55	25	4.9	5	50	1	3.0	15	44	7	3.8	37	66	25	5.0

* For counties in each division see Exhibit 1, page 93. [b], [c], [d], [e]. See foot-notes with these marks in Table 2, page 101.
† This page includes the Five Divisions of the State from which the fewest Weekly Reports were received.

EXHIBIT III.—*By Months and by Geographical Divisions of the State, the Names of 142 Observers whose Weekly Reports of Diseases for 1884 are Compiled in Tables 1, 2, 3, and 4, the Localities*[a] *for which they Report, and the Number of Reports received from each Observer.*

Divisions and Localities Represented and Physicians who Reported. (Health officers in italics; those also correspondents marked with a *.)	Weekly Reports in 1884.												
	Year, 1884.	Jan.	Feb.	March.	April.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
All Localities	*3947*	*385*	*306*	*294*	*321*	*281*	*301*	*407*	*315*	*302*	*362*	*301*	*372*
Upper Peninsular Division†	*162*	*20*	*19*	*20*	*14*	*11*	*6*	*9*	*12*	*12*	*14*	*12*	*13*
Houghton, H. W. Jones, M. D.	50	5	4	4	5	4	2	4	4	4	5	4	5
Ishpeming, *W. E. Harwood, M. D.*	20								4	4	5	4	3
Mackinac, *Samuel S. Jessop, M. D.*	52	5	4	4	5	4	4	5	4	4	4	4	5
Marquette, *A. Klein Theil, M. D.*	7		3	4									
Negaunee, *C. S. Lombard, M. D.*	17	5	4	4	4								
Sault St. Marie, *A. E. Bacon, M. D.*	3					3							
Sault St. Marie, *Geo. A. Harding, M. D.*	13	5	4	4									
Northwestern Division†	*182*	*10*	*10*	*11*	*15*	*16*	*16*	*18*	*15*	*16*	*20*	*16*	*19*
Cadillac, *J. Leeson, M. D*	12					4	4					4	
Cadillac, *C. R. Keach, M. D.*	20							3	3	4	5		5
Lake Township, V. F. Huntley, M. D.	45		2	3	5	4	4	5	4	4	5	4	5
Manistee, *D. E. Robinson, M. D.*	52	5	4	4	5	4	4	5	4	4	5	4	4
Manton, *J. B. Martin, M. D.*	53	5	4	4	5	4	4	5	4	4	5	4	5
Northern Division†	*86*	*5*	*4*	*4*	*5*	*4*	*6*	*10*	*7*	*4*	*10*	*12*	*15*
Boyne City, A. W. Nicholson, M. D.	9											4	5
Charlevoix, *W. M. Preston, M. D.*	48	5	4	4	5	4	4	5	3		5	4	5
Harbor Springs, *L. W. Gardner, M. D.*	29						2	5	4	4	5	4	5
Northeastern Division†	*115*	*10*	*8*	*8*	*10*	*8*	*8*	*9*	*11*	*8*	*10*	*10*	*15*
Alpena, J. D. Dunlop, M. D.	7											2	5
Alpena, *W. W. Wilson, M. D.*	43	5	4	4	5	4	4	4	4	4	5		
Au Sable, *D. H. Weir, M. D.*	3								3				
East Tawas, *James S. Reeves, M. D.*	53	5	4	4	5	4	4	5	4	4	5	4	5
Harrisville, D. W. Mitchell, M. D.	9											4	5
Western Division†	*349*	*40*	*35*	*32*	*21*	*24*	*27*	*45*	*23*	*23*	*25*	*24*	*30*
Cedar Springs, C. S. Ford, M. D.	26	5	4	4	5	4	4						
Evart, *R. C. Hepburn, M. D.*	4							4					
Grand Haven, *A. Vanderveen, M. D.**	27							5	4	4	5	4	5
Grand Rapids, Arthur Hazlewood, M. D.	30	5	4	4	5	4	4	4					
Grandville, *A. H. Weston, M. D.**	13	5	4	4									
Hersey, *E H. Wood, M. D.**	12	4	4	4									
Hesperia, *J. A. Porter, M. D.*	6		4	2									
Lowell, *A. B. Grant, M. D.*	29						2	5	4	4	5	4	5
Lowell, *O. C. McDannell, M. D.*	13	5	4	4									
Ludington, *P. P. Shorts, M. D.*	27	5	4	4	3	4	4	3					
Muskegon, *G. Chaddock, M. D.*	39	4				4	4	5	4	4	5	4	5
North Muskegon, *N. W. Andrews, M. D.*	48	4	4	3	4	4	3	5	3	4	5	4	5
Pentwater, *G. O. Switzer, M. D.*	21							5	4	3		4	5
Sand Lake, *Frank Chappell, M. D.*	6						2	4					
Whitehall, *J. H. Johnson, M. D.*	48	3	3	3	4	4	4	5	4	4	5	4	5
Northern Central Division†	*124*	*10*	*8*	*12*	*8*	*8*	*8*	*14*	*8*	*8*	*14*	*12*	*14*
Big Rapids, *I. W. Badger, M. D.*	53	5	4	4	5	4	4	5	4	4	5	4	5
Blanchard, *L. A. Houghton, M. D.*	28						2	5	4	4	5	4	4
Clare, *M. D. Davis, M. D.*	4							4					
Farwell, *E. E. Bracey, M. D.*	13	5	4	4									
Mecosta, *J. H. Waller, M. D.*	9				3	4	2						
Meredith, *A. J. Scott, M. D.**	13										4	4	5
Mount Pleasant, *M. F. Fasquelle, M. D.*	4			4									
Bay and Eastern Division†	*408*	*30*	*26*	*28*	*30*	*30*	*36*	*48*	*35*	*34*	*42*	*32*	*37*
Algonac, *W. K. Moore, M. D.*	28						2	5	4	4	5	4	4
Brockway, A. Mitchell, M. D.	49	5	4	4	5	4	4	5	4	4	4	3	3
Columbiaville, C. A. Wisner, M. D.	46		2	4	5	4	4	5	4	4	5	4	5
East Saginaw, Samuel Kitchen, M. D.	13	5	4	4									
East Saginaw, *J. S. Rouse, M. D.*	35					4	4	5	4	4	5	4	5
Marlette, *W. F. Dodge, M. D.*	14						2	5	3	4			
Port Huron, *M. Northup, M. D.**	34					3	4	5	4	4	5	4	5
Port Huron, *A. A. Whitney, M. D.*	26	5	4	4	5	4	4						
Saginaw, *N. D. Lee, M. D.*	13	5	4	4									
Saint Clair, *W. H. Smith, M. D.**	18	5	4	4	5								

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[a] In many cases the reports include sickness in the vicinity as well as the corporate limits of the places named.

* Health officer and correspondent. † For counties in each division see Exhibit 1, page 93.

EXHIBIT III.—CONTINUED.

Divisions and Localities Represented and Physicians who Reported.	Weekly Reports in 1884.												
(Health officers in italics; those also correspondents marked with a *.)	Year 1884.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
Bay and Eastern Division—*Continued*.†													
Sand Beach, *H. R. Hitchcock, M. D.*	39	----	----	----	5	4	4	5	4	4	5	3	5
South Bay City, S. E. Campbell, M. D.	21	----	----	----	----	----	----	3	4	2	4	3	5
Thornville, *J. S. Caulkins, M. D.**	53	5	4	4	5	4	4	5	4	4	5	4	5
West Bay City, *J. P. Webster, M. D.*	12	----	----	----	----	3	4	5	----	----	----	----	----
West Bay City, *J. W. Hauxhurst, M. D.**	7	----	----	----	----	----	----	----	----	----	4	3	----
Central Division†	*941*	*107*	*76*	*75*	*84*	*69*	*72*	*93*	*69*	*72*	*79*	*64*	*81*
Byron, *F. S. Ruggles, M. D.*	4	----	----	----	----	----	----	4	----	----	----	----	----
Fenton, *I. N. Brainerd, M. D.*	24	5	4	4	5	4	2	----	----	----	----	----	----
Flint, *A. A. Thompson, M. D.*	53	5	4	4	5	4	4	5	4	4	5	4	5
Gaines, *I. Parks, M. D.*	3	----	----	----	----	----	----	----	3	----	----	----	----
Greenville, C. S. Sheldon, M. D.	37	5	4	3	3	4	3	4	3	4	4	----	----
Hastings, A. P. Drake, M. D.	47	5	----	2	5	4	4	5	4	4	5	4	5
Hastings, *D. E. Fuller, M. D.*	21	5	4	4	5	3	----	----	----	----	----	----	----
Hastings, *W. P. Polhemus, M. D.*	35	----	----	----	----	4	4	5	4	4	5	4	5
Howard City, *J. N. Hathaway, M. D.*	53	5	4	4	5	4	4	5	4	4	5	4	5
Howell, H. R. Hitchcock, M. D.	11	5	4	2	----	----	----	----	----	----	----	----	----
Hoytville, O. S. Bailey, M. D.	3	3	----	----	----	----	----	----	----	----	----	----	----
Hubbardston, *J. H. Bacheler, M. D.*	13	5	4	4	----	----	----	----	----	----	----	----	----
Hubbardston, *C. S. Park, M. D.*	27	----	----	----	----	----	----	5	4	4	5	4	5
Ionia, *L. Joslin, M. D.*	12	----	----	----	----	----	2	4	3	3	----	----	----
Ionia, *S. V. Romig, M. D.*	13	5	4	4	----	----	----	----	----	----	----	----	----
Ithaca, J. P. Carpenter, M. D.	9	----	----	----	----	----	----	----	----	----	----	4	5
Ithaca, C. W. Marvin, M. D.	44	5	4	4	5	4	4	5	4	4	5	----	----
Lakeview, *A. H. Forsyth, M. D.*	52	5	3	4	5	4	4	5	4	4	5	4	5
Lansing, *O. Marshall, M. D.*	17	5	4	4	4	----	----	----	----	----	----	----	----
Linden, *J. P. Corcoran, M. D.*	25	5	4	4	5	4	3	----	----	----	----	----	----
Linden, *M. A. Tibbets, M. D.*	15	----	----	----	5	4	4	----	----	2	----	----	----
Maple Rapids, W. F. Reid, M. D.	26	5	4	4	5	4	4	----	----	----	----	----	----
Middleville, *G. W. Matteson, M. D.*	53	5	4	4	5	4	4	5	4	4	5	4	5
Muir, *B. E. Terrill, M. D.*	27	----	----	----	----	----	----	5	4	4	5	4	5
Otisville, *C. A. Wisner, M. D.*	7	5	2	----	----	----	----	----	----	----	----	----	----
Owosso, *C. McCormick, M. D.*	3	----	----	----	----	----	----	----	----	----	----	----	3
Owosso, A. J. Robb, M. D.	30	5	4	4	5	4	4	4	----	----	----	----	----
Pewamo, *R. H. Spencer, M. D.*	8	----	----	----	----	----	2	3	----	3	----	----	----
Portland, *G. D. Allen, M. D.*	27	----	----	----	----	----	----	5	4	4	5	4	5
Saint Johns, *L. W. Fasquelle, M. D.*	51	5	4	4	4	3	4	5	4	4	5	4	5
Sheridan, *W. H. Budd, M. D.*	31	----	----	----	----	----	4	5	4	4	5	4	5
Stanton, *A. L. Cory, M. D.*	47	4	3	4	3	3	4	4	4	4	5	4	5
Swartz Creek, *G. G. Gordon, M. D.**	53	5	4	4	5	4	4	5	4	4	5	4	5
Vernon, *A. G. Cowles, M. D.**	9	----	----	----	----	----	----	----	----	----	----	4	5
Woods Corners, George Pray, M. D.	51	5	4	4	5	4	4	5	4	4	5	4	3
Southwestern Division†	*333*	*41*	*28*	*24*	*24*	*19*	*23*	*36*	*30*	*28*	*33*	*22*	*25*
Bangor, *J. Camp, M. D.*	13	5	4	4	----	----	----	----	----	----	----	----	----
Berrien Springs, *W. F. Mason, M. D.*	12	----	----	----	----	----	2	4	4	2	----	----	----
Breedsville, *F. P. Robertson, M. D.*	3	----	----	----	----	----	----	----	----	----	3	----	----
Marcellus, *Fred Shellito, M. D.*	27	----	----	----	----	----	2	4	3	4	5	4	5
Niles, *O. P. Horn, M. D.*	53	5	4	4	5	4	4	5	4	4	5	4	5
Niles, I. Simpson, M. D.	5	5	----	----	----	----	----	----	----	----	----	----	----
Otsego, *Milton Chase, M. D.**	53	5	4	4	5	4	4	5	4	4	5	4	5
Plainwell, *B. Thompson, M. D.*	32	5	4	4	5	3	3	3	3	2	----	----	----
St. Joseph, B. F. Stratton, M. D.	45	5	4	4	4	4	4	5	4	4	5	2	----
Saugatuck, *W. W. Mather, M. D.*	3	3	----	----	----	----	----	----	----	----	----	----	----
Saugatuck, *H. H. Stimson, M. D.*	27	----	----	----	----	----	----	5	4	4	5	4	5
South Haven, *M. E. Bishop, M. D.*	53	5	4	4	5	4	4	5	4	4	5	4	5
Wayland, *E. H. Ryno, M. D.*	7	3	4	----	----	----	----	----	----	----	----	----	----
Southern Central Division†	*831*	*78*	*64*	*62*	*75*	*65*	*63*	*78*	*63*	*67*	*75*	*62*	*79*
Adrian, *J. Tripp, M.D.*	31	5	3	----	3	3	3	3	2	----	----	4	5
Albion, *R. A. Martin, M. D.*	53	5	4	4	5	4	4	5	4	4	5	4	5
Ann Arbor, *Conrad George, M. D.*	13	----	3	4	3	----	----	----	----	3	----	----	----
Brooklyn, *E. N. Palmer, M. D.**	13	5	4	4	----	----	----	----	----	----	----	----	----
Burr Oak, *C. D. Parsons, M. D.*	6	----	----	----	----	----	----	----	3	3	----	----	----
Coldwater, *J. M. Long, M. D.*	53	5	4	4	5	4	4	5	4	4	5	4	5
Coldwater, L. H. Wurtz, M. D.	53	5	4	4	5	4	4	5	4	4	5	4	5
Hillsdale, *Bion Whelan, M. D.**	24	5	2	2	5	4	4	----	----	2	----	----	----
Hudson, *A. R. Smart, M. D.**	51	4	4	4	5	4	4	5	4	4	5	3	5
Jackson (Prison), F. R. Crosby, M. D.	52	4	4	4	5	4	4	5	4	4	5	4	5
Jerome, A. A. Dunton, Jr., M. D.	53	5	4	4	5	4	4	5	4	4	5	4	5
Kalamazoo, *H. B. Hemenway, M. D.*	35	----	----	----	----	4	4	5	4	4	5	4	5

* Health Officer and Correspondent.

† For counties in each division see Exhibit 1, page 98.

[This Exhibit III. is continued on page 116.]

EXHIBIT III.—Continued.

Divisions and Localities Represented and Physicians who Reported.	Weekly Reports in 1884.												
(Health officers in italics; those also cor-respondents marked with a *.)	Year 1884.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
Southern Central Division—*Continued.*†													
Kalamazoo, *H. H. Schaberg, M.D.*	51	5	4	4	5	4	4	5	2	4	5	4	5
Kalamazoo, W. B. Southard, M. D.	53	5	4	4	5	4	4	5	4	4	5	4	5
Marshall, *Emory J. Marshall, M. D.*	32	----	----	----	----	3	4	5	3	4	5	4	4
Mendon, H. C. Clapp, M. D.	53	5	4	4	5	4	4	5	4	4	5	4	5
North Adams, *W. R. Ditmars, M. D.*	19	5	4	4	4	2	----	----	----	----	----	----	----
Quincy, *W. C. Marsh, M. D.*	2	----	----	----	----	2	----	----	----	----	----	----	----
Quincy, *D. H. Wood, M. D.*	2	----	----	----	----	----	----	----	2	----	----	----	----
Union City, *R. P. Beebe, M. D.**	51	5	4	4	5	4	4	5	3	4	5	3	5
Union City, E. H. Hurd, M. D.	53	5	4	4	5	4	4	5	4	4	5	4	5
Vicksburg, *C. H. McKain, M.D.*	27	--	----	----	----	----	----	5	4	4	5	4	5
Ypsilanti, *C. F. Ashley, M. D.*	33	----	----	----	----	3	4	5	4	3	5	4	5
Ypsilanti, *Edward Batwell, M. D.**	18	5	4	4	5	----	----	----	----	----	----	----	----
Southeastern Division†	*426*	*34*	*28*	*28*	*35*	*27*	*36*	*47*	*42*	*30*	*40*	*35*	*44*
Armada, *W. Flagler, M. D.*	40	----	----	----	5	4	4	5	4	4	5	4	5
Birmingham, *J. L. Campbell, M. D.*	5	----	----	----	----	----	2	----	3	----	----	----	----
Detroit, W. H. Rouse, M. D.	53	5	4	4	5	4	4	5	4	4	5	4	5
Holly, *L. E. Wickens, M. D.*	51	4	4	4	5	3	4	5	4	4	5	4	5
Memphis, *D. H. Cole, M. D.*	53	5	4	4	5	4	4	5	4	4	5	4	5
Monroe, *Geo. B. McCallum, M. D.*	11	----	----	----	----	----	4	3	4	----	----	----	----
Monroe, *J. C. Wood, M. D.*	13	5	4	4	----	----	----	----	----	----	----	----	----
Northville, *J. M. Swift, M. D.**	53	5	4	4	5	4	4	5	4	4	5	4	5
Orion, *J. R. Davis, M. D.*	7	----	----	----	----	----	2	5	----	----	----	----	----
Pontiac, *W. McCarroll, M. D.*	38	5	4	4	5	4	4	----	3	----	----	4	5
Richmond, *C. L. Chandler, M. D.*	27	----	----	----	----	----	----	5	4	4	5	4	5
Romeo, *Wm Greenshields, M. D.*	22	----	----	----	----	----	----	4	4	2	5	3	4
Wyandotte, *E. P. Christian M. D.**	53	5	4	4	5	4	4	5	4	4	5	4	5

* Health Officer and Correspondent.

† For counties in each division see Exhibit 1, page 93.

WHAT DISEASES CAUSE MOST SICKNESS?

The answer to the above question for 1884 is given in Exhibit IV, which also affords a comparison of statements for the year 1884 with similar statements for preceding years. Until 1884, intermittent fever has caused most sickness in Michigan, but in 1884 neuralgia heads the list, and rheumatism comes second, with intermittent fever third on the list. The relative amount of sickness from remittent fever has considerably decreased each year until 1884, and in 1884 there was much less sickness reported from it than the average for the eight years, 1877–84. This is shown in Exhibits I and XVIII, on pages 94 and 139.

Exhibit V, on pages 118 and 119, contains for the eleven divisions of the State a statement as to what disease caused most sickness in each division. The six divisions from which most reports were received are arranged on page 112; and the five divisions from which fewest reports were received are arranged on page 113.

EXHIBIT IV.—*Diseases from which there seems to have been the Most Sickness in Michigan in 1884, as indicated by the Per Cent of Weekly Reports Stating Presence of the Diseases, as studied in connection with the Average Order of Prevalence of said Diseases when Reported Present; also Order, Per Cent of Reports, and Average Order for the same Diseases in 1883, 1882, and 1881.*

	1884.				1883.			1882.			1881.		
	Order.*	Diseases in Order of Apparent Sickness in 1884, Most Prevalent one First.	Per Cent of Reports Stating Pres'ce of.[d]	Av. Order of Prevalence when Pres.[e]	Order.*	Per Cent of Reports Stating Pres'ce of.[d]	Av. Order of Prevalence when Present.[e]	Order.*	Per Cent of Reports Stating Pres'ce of.[d]	Av. Order of Prevalence when Present.[e]	Order.*	Per Cent of Reports Stating Pres'ce of.[d]	Av. Order of Prevalence when Present.[e]
More Sickness than Average for 27 Diseases, in 1884.	1	Neuralgia	70	3.3	2	69	3.3	2	68	3.6	4	65	4.3
	2	Rheumatism	70	3.6	4	68	3.7	4	68	3.8	2	71	4.6
	3	Intermittent Fever	65	2.5	1	69	2.3	1	71	2.0	1	82	2.4
	4	Bronchitis	61	3.2	3	66	3.2	3	65	3.3	3	62	3.9
	5	Consumption, Pulm.	63	4.3	5	61	4.5	5	66	4.6	7	71	5.6
	6	Diarrhea	52	3.3	6	49	3.7	7	48	3.8	6	52	3.9
	7	Tonsilitis	50	3.7	7	50	3.9	9	47	3.9	8	48	4.5
	8	Remittent Fever	44	3.3	9	41	3.3	6	48	3.3	5	54	3.5
	9	Influenza	41	3.3	8	43	3.2	8	40	3.1	9	35	3.5
	(10)	Av. for 27 Diseases†	29	4.2	(11)	30	4.2	(11)	30	4.2	(11)	33	4.9
Less than said Average.	10	Pneumonia	29	4.5	10	38	4.7	10	39	4.4	10	41	5.4
	11	Inflammation of Kidney	26	5.0	....	......	......	....	......	......	....	......	......
	12	Erysipelas	26	5.2	12	25	5.5	15	22	5.5	17	23	6.2
	13	Whooping-cough	23	4.5	19	15	5.2	13	17	4.4	19	15	6.3
	14	Dysentery	23	5.0	13	21	5.2	18	17	5.3	15	23	5.1
	15	Cholera Morbus	22	4.9	15	18	5.0	17	17	5.2	14	26	5.3

* Judging from the per cent of reports which stated presence of the diseases, in connection with the order of prevalence when prevalent.

† For 1883, '82 and '81 the average is for 26 diseases.

d This column states what per cent the number of reports stating presence of a disease is of the whole number of reports received for the time specified, from *all observers* in the State. It combines and states in a general way, an idea of the *time* a disease was prevalent, with an idea of the area of its prevalence.

e The disease having the greatest number of cases was to be marked 1 in the order; the disease having the next greatest number of cases, 2; and so on. Diseases not present were to be marked 0. The numbers in this column are found by dividing the totals of the Order of Prevalence columns, in Table 3 (omitted in this Report), by the number of men who reported the disease present. The column is, therefore, an average not for all the localities represented, but only for those at which the given disease was reported present. The numbers in the "Average" lines for this column are found by dividing the sum of the totals in the order of prevalence columns, in Table 3, for all diseases reported present, by the sum of the numbers of men who reported the different diseases present, thus counting each man once for every disease he reported present. As a rule, small numbers in this column indicate the large prevalence of the disease, and *vice versa;* but the greater the number of diseases reported present by each observer, from week to week, the greater will be the "average" in this column.

EXHIBIT V.—*In each of eleven Geographical Divisions* of the State, the fifteen Diseases from which there seems to have been the Greatest Amount of Sickness in 1884, as indicated by the Per Cent of Weekly Reports Stating Presence of each of 27 Leading Diseases, when studied in connection with the Average order of Prevalence of said diseases when reported present.*

	Order.†	Diseases in Order of Apparent Amount of Sickness, Most Prevalent one First.	Per Cent of Reports Stating Pres'nce of.[d]	Av. Order of Prevalence when Pres.[e]	Diseases in Order of Apparent Amount of Sickness, Most Prevalent one First.	Per Cent of Reports Stating Pres'nce of.[d]	Av. Order of Prevalence when Pres.[e]	Diseases in Order of Apparent Amount of Sickness, Most Prevalent one First.	Per Cent of Reports Stating Pres'nce of.[d]	Av. Order of Prevalence when Pres.[e]
		BAY AND EAST'S DIV.*			SOUTHWESTERN DIV.*			SOUTHERN-CEN. DIV.*		
More Sickness than Av. for 27 Diseases.	1	Neuralgia	80	3.6	Intermittent Fever	87	2.2	Intermittent Fever	75	2.8
	2	Intermittent Fever	68	2.7	Neuralgia	86	3.2	Neuralgia	82	3.2
	3	Consumption, Pul.	81	4.3	Rheumatism	81	3.9	Rheumatism	77	3.5
	4	Rheumatism	78	4.3	Influenza	56	2.9	Bronchitis	65	3.2
	5	Bronchitis	69	3.7	Remittent Fever	49	3.2	Diarrhea	61	3.3
	6	Diarrhea	58	3.7	Consumption, Pul.	77	5.2	Influenza	48	2.9
	7	Whooping-cough	53	4.3	Bronchitis	58	4.2	Tonsilitis	61	3.5
	8	Tonsilitis	54	4.7	Tonsilitis	53	4.2	Remittent Fever	59	3.5
	9	Remittent Fever	48	4.8	Diarrhea	39	3.7	Consumption, Pul.	66	5.1
	10	Influenza	43	4.8						
	(10)				Av. for 27 Diseases	30	3.9	Av. for 27 Diseases	34	4.1
	(11)	Av. for 27 Diseases	37	5.0						
Less	10				Whooping-cough	17	3.5	Pneumonia	35	4.6
	11	Cholera morbus	31	5.7	Cholera Morbus	20	3.9	Cholera Morbus	26	4.2
	12	Scarlet Fever	25	5.1	Erysipelas	29	4.4	Cholera Infantum	16	3.9
	13	Pneumonia	34	6.0	Cholera Infantum	17	3.9	Inflam. of Kidney	25	4.5
	14	Typho-mal. Fever	30	5.8	Scarlet Fever	8	3.4	Dysentery	26	4.7
	15	Cholera Infantum	27	5.8	Pneumonia	26	4.6	Measles	12	4.1
		WESTERN DIVISION.*			CENTRAL DIV.*			SOUTHEASTERN DIV.*		
More Sickness than Av. for 27 Diseases.	1	Intermittent Fever	62	2.0	Intermittent Fever	69	2.2	Consumption, Pul.	82	3.1
	2	Remittent Fever	57	2.5	Neuralgia	67	2.7	Rheumatism	76	3.8
	3	Diarrhea	41	2.9	Rheumatism	65	2.9	Bronchitis	68	2.5
	4	Neuralgia	55	3.7	Diarrhea	47	2.9	Neuralgia	58	3.8
	5	Bronchitis	42	3.5	Bronchitis	58	3.3	Intermittent Fever	55	3.3
	6	Influenza	33	2.9	Remittent Fever	36	2.6	Tonsilitis	48	3.0
	7	Rheumatism	49	4.1	Influenza	41	2.9	Diarrhea	49	4.4
	8	Scarlet Fever	22	3.4	Consumption, Pul.	55	3.7	Remittent Fever	37	3.6
	9				Tonsilitis	40	3.6	Influenza	38	4.7
	10							Diphtheria	38	5.4
	11							Pneumonia	34	5.0
	(9)	Av. for 27 Diseases	23	3.7						
	(10)				Av. for 27 Diseases	25	3.3			
	(12)							Av. for 27 Diseases	35	5.7
Less	9	Typho-mal. Fever	16	3.3						
	10	Dysentery	24	3.8	Measles	7	2.9			
	11	Measles	10	3.1	Pneumonia	27	3.7			
	12	Consumption, Pul.	37	4.7	Whooping-cough	14	3.3	Whooping-cough	36	6.2
	13	Tonsilitis	32	4.4	Inflam. of Kidney	23	3.8	Erysipelas	37	6.8
	14	Pneumonia	17	4.0	Cerebro-spin'l M'g's.	6	3.2	Cholera Morbus	32	6.8
	15	Diphtheria	8	3.6	Dysentery	17	3.6	Typho-mal. Fever	16	4.0

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* For counties in each division see Exhibit 1, page 93.

† Judging from the per cent of reports in connection with the "average order of prevalence where present." [d], [e]. See footnotes with these marks on page 117.

EXHIBIT V.—Continued.

	Order.†	Diseases in Order of Apparent Amount of Sickness, Most Prevalent one First.	Per Cent of Reports Stating Pres'nce of.[d]	Av. Order of Preva-lence when Pres.[e]	Diseases in Order of Apparent Amount of Sickness, Most Prevalent one First.	Per Cent of Reports Stating Pres'nce of.[d]	Av. Order of Preva-lence when Pres.[e]	Diseases in Order of Apparent Amount of Sickness, Most Prevalent one First.	Per Cent of Reports Stating Pres'nce of.[d]	Av. Order of Preva-lence when Pres.[e]
		Upper Peninsular Div.*			Northern Cent. Div.*			Northeastern Div.*		
More Sickness than Av. for 27 Diseases.	1	Bronchitis	91	2.6	Intermittent Fever.	59	2.3	Bronchitis	96	2.4
	2	Consumption	72	3.0	Remittent Fever	53	2.2	Neuralgia	94	3.4
	3	Diarrhea	55	3.2	Rheumatism	59	3.6	Rheumatism	95	3.6
	4	Influenza	41	2.6	Diarrhea	51	3.4	Tonsilitis	82	3.1
	5	Neuralgia	52	3.4	Bronchitis	48	3.0	Diarrhea	82	3.1
	6	Rheumatism	65	4.4	Neuralgia	53	3.8	Inflam. of Kidney	80	4.3
	7	Tonsilitis	56	4.4	Tonsilitis	50	4.3	Consumption	74	5.5
	8	Typhoid Fever	33	4.0	Consumption	44	5.6	Remittent Fever	37	3.0
	9	Whooping-cough	23	3.6	Typho-mal. Fever	41	5.4	Influenza	29	3.1
	10	Dysentery	25	3.9	Inflam. of Bowels	2	1.7	Erysipelas	37	3.9
	11	Inflam. of Kidney	50	5.3	....	....	....	....	....	....
	(11)	....	....	....	Av. 27 Diseases	30	4.5	Av. 27 Diseases	35	4.1
	(12)	Av. 27 Diseases	29	4.2	....	....	....	....	....	....
Less	11	....	....	....	Inflam. of Kidney	2	2.3	Intermittent Fever.	11	3.3
	12	Cholera Infantum	13	3.4	Dysentery	23	4.6	Pneumonia	36	5.4
	13	Cholera Morbus	10	4.0	Whooping-cough	25	5.0	Dysentery	42	5.8
	14	Pneumonia	30	5.1	Diphtheria	16	4.9	Typho-mal. Fever	16	4.1
	15	Inflam. of Bowels	21	5.2	Erysipelas	29	6.2	Measles	3	3.3

	Order.†	Northern Div.*	Per Cent of Reports Stating Pres'nce of.[d]	Av. Order of Preva-lence when Pres.[e]	Order.	Northwestern Division.*	Per Cent of Reports Stating Pres'nce of.[d]	Av. Order of Preva-lence when Pres.[e]
More Sickness than Av. for 27 Diseases.	1	Neuralgia	40	1.9	1	Intermittent Fever	85	1.9
	2	Intermittent Fever.	35	1.8	2	Diarrhea	63	3.3
	3	Bronchitis	26	1.5	3	Rheumatism	65	3.8
	4	Diarrhea	28	1.7	4	Neuralgia	68	4.1
	5	Influenza	13	1.0	5	Influenza	52	3.3
	6	Tonsilitis	31	2.2	6	Tonsilitis	53	3.6
	7	Typhoid Fever	20	1.6	7	Bronchitis	47	3.4
	8	Rheumatism	24	2.0	8	Typho-malarial Fever	46	3.8
	9	Inflam. of Brain	2	1.0	9	Pneumonia	38	3.7
	10	Pneumonia	20	2.0	10	Inflammation of Kidney	48	4.8
	11	Typho-mal. Fever	15	1.9	11	Remittent Fever	39	4.2
	12	Inflam. of Kidney	13	1.8	12	Inflammation of Brain	5	1.9
	13	Dysentery	13	1.8	(13)	Average 27 Diseases	34	4.1
	14	Consumption	17	2.1	13	Dysentery	35	4.2
	(15)	Av. 27 Diseases	15	2.0	14	Cholera Morbus	22	3.3
Less..	15	Cholera Infantum	7	1.8	15	Typho-malarial Fever	46	3.8

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* For counties in each division see Exhibit 1, page 93.

† Judging from the per cent of reports in connection with the "average order of prevalence where present." [d], [e]. See footnotes with these marks on page 117.

EXHIBIT VI.—*Names of Stations where were made the Observations of Meteorological Conditions used in Exhibit VIII and following exhibits, relative to Sickness and Meteorological Conditions in 1884; also the Temperature, Humidity, Cloudiness, Ozone, Velocity of Wind, or Atmospheric Pressure, at each Station for which Observations of the given condition are included in the summary statements relative to that condition in said exhibits.*

Stations.* (Those of U. S. Signal Service in italics.)	Temperature.		Humidity.		Per Cent. of Cloudiness.	Ozone.		Wind, Av. Velocity.	Atmospheric Pressure.		
									Range.		
	Av. Daily Range.	Average.	Relative.	Absolute.		Day.	Night.		Monthly.	Av. Daily.	Average.
Number of Stations included in Average	18	20	19	19	21	20	20	9	18	18	18
Average	19.01	44.72	75	3.31	57	2.75	3.11	9.3	.976	.215	29.205
Marquette	18.87	39.03	69	2.65	53	1.84	2.20	8.6	1.016	.234	29.270
Manistique	23.06	40.39	81	3.05	49	3.02	4.20	......	1.047	.229	29.327
Escanaba	16.89	39.23	73	2.85	57	3.36	3.60	9.0	1.021	.229	29.319
Traverse City	18.75	42.91	83	3.39	59	2.17	2.27	......	1.027	.222	29.341
Mackinaw City	15.28	40.65	76	2.93	60	2.78	3.10	9.4	1.069	.233	29.339
Alpena	16.16	40.43	75	2.88	53	3.18	4.52	9.0	1.021	.226	29.323
Grand Haven	14.19	46.94	74	3.46	62	3.28	3.33	10.7	.941	.204	29.341
Reed City	24.67	43.15	65	2.95	61	2.83	3.06	......	.965	.213	28.869
Port Austin	......	......	......	......	......	2.64	3.77	......	.972	.222	29.363
Port Huron	16.27	44.43	77	3.47	54	2.69	2.99	9.4	.966	.209	29.301
Thornville	16.60	47.74	80	3.73	52	2.55	3.45	......	.953	.210	28.970
Agr'l College	20.30	45.66	81	3.57	58	......	......	......	.932	.200	29.087
Ionia	21.68	45.66	78	3.49	61	1.96	1.70	......	.940	.209	29.294
Lansing	19.23	47.43	71	3.38	55	2.79	3.30	9.7	.944	.206	29.037
Swartz Creek	19.92	45.48	75	3.37	53	3.58	3.95	......	......	......	......
Ann Arbor	......	45.56	79	3.41	61	3.02	2.68	9.0	.947	.210	29.030
Battle Creek	......	......	......	......	54	2.06	2.14	......	......	......	......
Hillsdale	21.67	47.01	71	3.42	62	2.85	3.52	......	......	......	......
Kalamazoo	......	47.36	......	......	70	2.45	2.80	......	......	......	......
Marshall	18.91	48.63	75	3.71	56	3.63	3.19	......	.939	.207	29.038
Tecumseh	22.96	47.05	79	3.62	53	2.39	2.42	......	.937	.200	29.135
Detroit	16.79	49.71	69	3.55	54	......	......	9.0	.934	.210	29.315

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*At the U. S. Signal Service Stations the observations of mean temperature, humidity, cloudiness, and atmospheric pressure were made at 7 A. M., 3 P. M., and 11 P. M., Washington mean time, which is faster than local time, as follows: At Port Huron, 22 m.; at Detroit, 24 m.; at Alpena, 26 m.; at Grand Haven, 37 m.; at Escanaba, 40 m.; at Marquette, 41 m. At the other stations the observations of these conditions were made at 7 A. M., 2 P. M., and 9 P. M., local time. Observations of range of temperature were made with registering thermometers read and set at 11 P. M., at the Signal Service Stations; at 7 A. M. at other stations. For the ozone observations the test-paper was exposed from 7 A. M. to 2 P. M. for the day observations, and from 9 P. M. to 7 A. M. for the night observation. The velocity of wind was recorded by registering anemometers. These subjects are treated by months in 1884, and for previous years, in an article on Meteorological Conditions in Michigan in 1884, on pages 1-86 of this Report.

EXHIBIT VII.—*Showing Comparisons between the Averages of certain Meteorological Conditions at Stations in Michigan in 1884, with those in preceding Years. (Abstracted from Exhibit 5, page 26; Exhibit 8, page 32; Exhibit 11, page 38; Exhibit 13, page 39; Exhibit 18, page 50; Exhibit 22, page 56; Exhibit 27, page 63; Exhibit 28, page 63; and Exhibit 29, page 69.)*

Meteorological Conditions.	Years, etc.	Av.	Jan.	Feb.	Mar.	April.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
Average Temperature	In 1884 higher than Av. for 8 years, 1877-84	......	......	......	......	......	......	1.50	......	......	2.67	.22	......	......
	Lower	2.02	6.29	4.66	2.26	2.48	2.22	......	3.95	2.75	......	......	1.46	2.48
Average Daily Range	In 1884 more than Av. for 6 years, 1879-84	.84	1.05	.21	2.21	......	......	1.86	1.00	1.18	1.10	1.13	1.22	.78
	Less	......	......	......	......	.27	1.35	......	......	......	......	......	......	......
Absolute Humidity	In 1884 more than Av. for 8 years, 1879-84	......	......	......	......	......	......	.24	......	......	.21	......	......	......
	Less	.18	.32	.22	.10	.31	.18	......	.73	.40	......	.07	.20	.09
Relative Humidity	In 1884 more than Av. for 7 years, 1878-84	0	......	3	2	......	3	1	......	0	......	13	1	1
	Less	......	1	......	......	1	......	......	1	......	2	......	......	......
Rainfall	In 1884 more than Av. for 8 years, 1877-84	......	.15	.79	......	......	......	......	......	......	.06	.75	......	2.14
	Less	7.12	......	......	.23	.38	.39	1.56	.81	1.18	......	......	1.17	......
Velocity of Wind	In 1884 greater than Av. for 5 years, 1880-84	......	.2	......	......	.1	.5	......	.5	......	.7	1.2	......	1.3
	Less	.4	......	4.5	3.0	......	......	1.7	......	1.0	......	......	.7	......
Cloudiness	In 1884 greater than Av. for 8 years, 1877-84	1	5	16	......	2	4	......	5	......	......	......	......	3
	Less	......	......	......	3	......	......	8	......	6	3	2	5	......
Day Ozone	In 1884 more than Av. for 8 years, 1877-84	......	......	......	......	......	......	......	......	......	......	......	......	......
	Less	.34	.02	.21	.50	.35	.21	.28	.24	.21	.43	.38	.59	.54
Night Ozone	In 1884 more than Av. for 8 years, 1877-84	......	.02	.20	......	......	.11	......	.12	.34	.07	......	......	......
	Less	.07	......	......	.43	.45	......	.21	......	......	......	.13	.51	.48
Range of Barometer	In 1884 greater than Av. for 7 years, 1878-84	.051	.068	.006	.062	.045	.003	.183	......	.064	.029	.075	.026	.052
	Less	......	......	......	......	......	......	......	.006	......	......	......	......	......

CLIMATE AND SICKNESS.*

Exhibit VIII (page 124) is an attempt to learn something of the relations of bronchitis to meteorological conditions, by noting whether each condition was above or below its average for the year, in months when more, and in months when less bronchitis than the average for the year was reported. The months are arranged in order according to the amount of bronchitis reported, those in which most bronchitis was reported being placed first in the column, and those in which more bronchitis than the average was reported being placed above the average line, the others below that line. The conditions for each month are printed, in the proper columns, in the line for the month. The statements being thus arranged, it is easy to see whether the temperature, the velocity of the wind, or any other condition represented, was above its average for the year in months when more than the average amount of bronchitis was reported and in months when less bronchitis was reported. That the comparisons may the more readily be held in mind, propositions have been made concerning the relations of bronchitis to meteorological conditions (stated on this page), grouping the conditions into two classes. The letters *a* and *b*, in the Exhibit, mark exceptions to these propositions. It is not supposed that the propositions are in every case true; but they serve to bring out the evidence of the exhibit on the subject in question. This evidence is to be had by noting the number and force of the exceptions to the propositions, and also whether the exception is explained by facts shown in other columns. A summary of the evidence is presented in Exhibit XXII, near the close of this article.

Exhibits and propositions similar to those relative to bronchitis, but relating to other diseases, are given on following pages. To prevent confusion it has been thought best not to change the statement of the propositions to fit the evidence concerning each disease,—except that they are differently stated for the summer diseases (beginning with the exhibit on diarrhea) and for the winter diseases (beginning with that on bronchitis), a somewhat arbitrary classification of the diseases treated, but one useful for the present purpose.

RELATIONS OF BRONCHITIS TO METEOROLOGICAL CONDITIONS.

PROPOSITION 1.*—That in months when **more** than the average per cent of weekly reports stated the presence of Bronchitis the average daily range of temperature, the relative humidity of the atmosphere, the average per cent of cloudiness, the ozone, the average velocity of the wind, the monthly and the average daily range of the barometer, and the average daily pressure of the atmosphere were **greater** than the average for the year; and in months when **less** than the average per cent of reports stated the presence of Bronchitis these conditions were **less** than the average for the year. In Exhibit VIII, page 124, the letter *a* marks exceptions to this proposition for the year 1884. As regards monthly range of barometer, there is, for 1884, no exception to Proposition 1, relating to Bronchitis.

PROPOSITION 2.*—That in months when **more** than the average per cent of weekly reports stated the presence of Bronchitis, the average daily temperature, and the absolute humidity of the atmosphere were **less** than the average for the year; and in months when **less** than the average per cent of reports stated the presence of Bronchitis these conditions were **greater** than the average for the year. In Exhibit VIII, page 124, the letter *b* marks exceptions to this proposition for months in 1884. As regards average daily temperature and absolute humidity there is for 1884 no exception to proposition 2 relating to Bronchitis.

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* The remarks under this head are applicable, also, by changing the name of the disease to diseases treated in Exhibits X, XII, XIII, XIV and XV, on following pages.
The meteorological data are from places indicated in Exhibit VI, page 120.

PROPOSITION 3.—For those months which are not, as regards the absolute humidity of the atmosphere, exceptions to Proposition 2, it is true also that the quantity of vapor inhaled daily was **less** than the average, and the quantity exhaled daily in excess of that inhaled was **greater** than the average in months when **more** than the average per cent of reports stated presence of Bronchitis; and that **more** vapor was inhaled and a **less** excess exhaled daily in months when the per cent of reports stating presence of Bronchitis was **less** than the average.

EXHIBIT IX.—SICKNESS FROM BRONCHITIS, 1877–84.—*By Year and Months for each of the Eight Years 1877–84, Stating on what Per Cent of the Weekly Reports Received Bronchitis was Reported Present, and Comparing the Per Cents for 1884 with the Averages for Corresponding Months in those Years.*

Years, Etc.	Annual Av.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
Average 8 Years 1877-84	63	78	78	77	72	62	54	43	42	49	55	68	73
1877	55	76	72	72	65	45	31	25	22	37	48	71	77
1878	64	77	75	74	71	65	56	41	45	55	60	73	81
1879	64	83	87	83	78	65	54	40	41	50	59	65	77
1880	64	81	84	82	68	59	57	44	45	46	57	67	72
1881	62	86	86	80	78	62	53	38	37	44	44	66	68
1882	65	73	70	75	74	70	62	51	44	57	59	71	71
1883	66	77	80	82	76	70	62	56	53	53	57	61	69
1884	61	71	71	71	65	59	56	49	47	50	56	69	70
In 1884 **Greater** than Av. 1877-84	......	....	....	....	....	....	2	6	5	1	1	1	....
In 1884 **Less** than Av. 1877-84	2	7	7	6	7	3	....	....	....	....	....	....	3

EXHIBIT VIII.—BRONCHITIS.—*Stating for the Year and for each Month of the Year 1884, what Per Cent of the Weekly Reports of Diseases Stated Presence of Bronchitis, and what were the Meteorological Conditions, as Observed at Stations in Michigan.*[*]

Bronchitis.				Temperature. F.		Humidity of Air,[§] Av. of 3 Daily Observations.		Vapor Inhaled and Exhaled from Air Passages, by one Person in 24 Hours. (Troy Ozs.)			Ozone—Relative Scale of 10°.			Atmospheric Pressure. Inches. Reduced to 32° F.		
Months in Order of Greatest Per Cent of Weekly Reports Stating Presence of,[†]		Per Cent of Weekly Reports Stating Presence of,[†]	Av. Order of Prevalence where Present,[†],[‡]	Av. Daily Range by Registering Thermometers.	Average of Three Daily Observations.	Relative Per Cent of Saturation.	Absolute—Grs. of Vapor in a Cubic Foot of Air.	Inhaled,[‖]	Exh'l'd in excess of that Inhaled,[¶]	Av. Per Cent of Cloudiness.	Day Observation, 7 A. M. to 2 P. M.	Night Observation, 9 P. M. to 7 A. M.	Av. Velocity of Wind, Miles per Hour, by Anemometer.	Range. Monthly, and for Year.	Range. Av. Daily, by Three Daily Observations.[**]	Average Pressure.
More than Av. Per Ct. of Bronchitis.	Jan	71	2.6	*a*17.72	15.14	80	1.09	.68	11.00	73	3.42	3.98	11.1	1.308	.307	29.274
	Mar	71	2.6	19.88	28.78	77	1.77	1.11	10.57	58	3.03	3.74	*a*8.8	1.122	.277	*a*29.202
	Feb	71	2.6	*a*17.79	20.94	82	1.37	.86	10.82	78	3.36	4.31	*a*9.2	1.205	.232	*a*29.204
	Dec	70	2.8	*a*14.09	24.77	83	1.69	1.06	10.62	80	*a*2.62	*a*3.07	10.8	1.258	.281	29.229
	Nov	68	3.0	*a*16.37	34.53	79	2.11	1.32	10.36	62	*a*2.40	*a*2.80	10.3	1.019	.232	29.213
	Apr	65	2.9	19.22	42.00	*a*67	2.42	1.51	10.17	*a*53	2.90	*a*3.09	10.1	1.260	*a*.205	*a*29.147
Average		61	3.2	19.01	*c*44.72	75	*c*3.31	2.07	9.61	57	2.75	3.11	9.3	*c*.976	.215	29.205
Less than Av. Per Cent of Bronchitis.	May	59	3.1	*a*19.50	54.38	70	3.78	2.36	9.32	52	*a*2.91	*a*3.28	*a*9.4	.828	.177	29.131
	Oct	56	3.7	18.69	51.56	*a*75	3.72	2.33	9.35	55	2.33	2.74	*a*10.5	.787	.203	*a*29.268
	June	56	3.3	*a*21.90	67.04	73	5.59	3.49	8.19	40	2.64	2.70	6.8	.659	.116	*a*29.273
	Sept	50	4.4	*a*20.87	64.72	73	5.24	3.28	8.40	42	2.28	2.42	9.0	.967	.103	*a*29.210
	July	49	3.9	*a*20.83	66.70	71	5.40	3.38	8.30	48	2.50	2.57	7.9	.571	.127	29.100
	Aug	47	4.3	*a*21.27	66.10	73	5.52	3.45	8.23	41	2.62	2.62	7.9	.731	.154	*a*29.216

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[a] An exception to the proposition that **more** than the average per cent of weekly reports stated presence of bronchitis in months when the meteorological condition named at the head of the column was **greater** than the average for the year; and **less** in months when the same condition was **less** than the average. See proposition 1, relating to bronchitis, page 122.

[b] An exception to the proposition that **more** than the average per cent of weekly reports stated presence of bronchitis in months when the meteorological condition named at the head of the column was **less** than the average for the year; and **less** in months when the same condition was **greater** than the average for the year. See proposition 2, relating to bronchitis, pages 122-123.

[c] As regards monthly range of barometer, there is, for 1884, no exception to proposition 1, relating to bronchitis. There is, for 1884, no exception to proposition 2, relating to bronchitis.

[*] How many stations, and what stations, are represented in the statements for each meteorological subject may be seen by referring to Exhibit VI, page 120, in which the stations are named, and a statement for the year 1884, in relation to each meteorological subject, is given for each station included in the average for that subject. In Exhibit VI is also stated what time the tri-daily observations were made at each station. Additional statements relative to meteorological conditions may be found in an article on the Principal Meteorological conditions in Michigan in 1884, on pages 1-86 of this report. Statements relative to the soil-moisture and ground water, by months in 1884, are given in Exhibit 4, on pages 22 and 23.

[†] Explanations of statements in these columns, and other statements relative to the prevalence, in 1884, of the diseases under consideration, may be found in Tables 2, pp. 100-111, and 4, page 112, of this Report, and also in Diagrams 1, (p. 95), 2, 3, 4, and 5, on following pages. When the per cent of reports stated for any disease is the same for two months, or for any month is the same as the average, the order of months in the first column of these exhibits has been determined by reference to fractional per cents.

[‡] Small numbers in this column indicate great prevalence in the localities where the disease occurred, as compared with other diseases; and large numbers a less prevalence.

[§] Calculated from readings of dry bulb and wet bulb thermometers.

[‖] Calculated for 18 respirations per minute, of 20 cubic inches of air each. (The numbers in this column are just five-eighths of those in the next preceding column.)

[¶] Assuming the air exhaled to be saturated with vapor at the temperature of 98° F., in which case each cubic foot of air contains 18.69 grains of vapor, and 18 respirations per minute, of 20 cubic inches of air each, make 11.68 Troy ounces of vapor exhaled daily. No correction has been made for expansion of air after it is inhaled.

[**] The daily range from which numbers in this column were computed is the difference between the highest and the lowest of the four observations taken during the 24 hours, namely, at 7 A. M., 2 P. M., 9 P. M., of one day, and 7 A. M. of the following day, or at U. S. Signal Service Stations, at 7 A. M., 3 P. M., 11 P. M., and 7. A. M., Washington mean time, as stated in the * foot-note on page 28.

Proposition 3 also holds true in relation to pneumonia, membranous croup, diphtheria, tonsilitis, influenza, scarlet fever, rheumatism, neuralgia and pulmonary consumption, treated in Exhibits X, XII, XIII, XIV and XV, on following pages.

What per cent of weekly reports received in 1884 stated presence of bronchitis is graphically represented by months in Diagram 1, page 95.

The evidence of Exhibit VIII confirms that of similar exhibits relating to bronchitis in previous years.

What per cent of the reports received stated presence of bronchitis by months in each of the years 1877–84; also the average for those years, and a comparison of 1884 with that average, are shown in Exhibit IX above.

By comparing Exhibit IX above, stating sickness from bronchitis by months in each of the years 1877–84, with Exhibit VII, page 121, stating the mean temperature by months in the same years, it will be seen that the relation between bronchitis and temperature is not the same in 1884 as in 1883. For 1884 the average sickness from bronchitis was below the average of that for the 8 years, while the average temperature was also below. It will be seen, also, that the per cent of reports stating the presence of bronchitis was greater than the average from June to November. The temperature was also higher in these months except in June, September, and October. The average of bronchitis for July and August, however, was considerably above, while the temperature for those months was considerably below the average for the months of July and August in the eight years 1877–84.

RELATIONS OF PNEUMONIA AND OTHER "COLD WEATHER" DISEASES TO METEOROLOGICAL CONDITIONS.

PROPOSITION 1.—That in months when **more** than the average per cent of weekly reports stated the presence of pneumonia (or of membranous croup, diphtheria, tonsilitis, influenza, scarlet fever, rheumatism, neuralgia, or pulmonary consumption), the average daily range of temperature, the relative humidity of the atmosphere, the average per cent of cloudiness, the ozone, the average velocity of the wind, the monthly and the average daily range of the barometer, and the average daily pressure of the atmosphere were **greater** than the average for the year; and in months when **less** than the average per cent of the reports stated the presence of pneumonia (or of the other diseases named), these conditions were **less** than the average for the year. In Exhibits X–XV, on page 127 and following pages, the letter *a* marks exceptions to this proposition for the year 1884.

PROPOSITION 2.—That in months when **more** than the average per cent of weekly reports stated the presence of pneumonia (or of membranous croup, diphtheria, tonsilitis, influenza, scarlet fever, rheumatism, neuralgia, or pulmonary consumption), the average daily temperature and the absolute humidity of the atmosphere were **less** than the average for the year; and in months when **less** than the average per cent of reports stated the presence of pneumonia (or of the other diseases named), these conditions were **greater** than the average for the year. In Exhibits X–XV, on page 127 and following pages, the letter *b* marks exceptions to this proposition for the year 1884.

What per cent of the weekly reports received in 1884 stated presence of pneumonia is graphically represented by months in Diagram 1, page 95. What per cent of the weekly reports received stated presence of pneumonia, and of other diseases mentioned in the two preceding paragraphs, by months in the years 1877–84, is stated in Exhibit XI, page 128, where are also given an average for those years and a comparison of 1884 with that average.

Comparing Exhibit XI, page 128, relating to sickness from tonsilitis and neuralgia in the eight years 1877–84 with Exhibit VII, page 121, relating to temperature for the same years, it may be noted that there is a general correspondence (inversely) between the lines stating variations in 1884 from the average temperature for those years, and from the average sickness reported from tonsilitis and neuralgia.

By Exhibit XI it may be seen that sickness reported from pneumonia was less in 1884 than the average for the eight years 1877–84, and also less in each of the months of 1884 than for the corresponding months of the eight years 1877–84. It will be borne in mind that the average temperature for 1884 was lower except in June, September and October than the average for the eight years 1877–84. The absolute humidity for 1884 was less than the average for the eight years 1877–84, both for the year and for each month except June and September. The average daily range of temperature for 1884 was greater for the year and for each month of the year except April and May than for the eight years 1877–84.

Neuralgia showed an increase for the year and for each month of the year 1884 over the average of the eight years 1877–84.

EXHIBIT X.—PNEUMONIA AND MEMBRANOUS CROUP.—*Stating for the Year and for each Month of the Year 1884, what Per Cent of the Weekly Reports of Diseases stated Presence of Pneumonia, also of Membranous Croup, and what were the Meteorological Conditions as Observed at Stations in Michigan.**

Months in Order of Greatest Per Cent of Weekly Reports Stating Presence of.		PNEUMONIA.		Temperature, F.		Humidity of Air.§ Av. of 3 Daily Observations.		Vapor Inhaled and Exhal'd (Tr'y oz.) from Air Passages, by one Person in 24 Hours.		Average Per Cent of Cloudiness.	Ozone,—Relative, Scale of 10°.		Average Velocity of Wind, Miles Per Hour, by Anemometer.	Atmospheric Pressure. Inches. Reduced to 32° Fahr.		
		Per Cent of Weekly Reports Stating Presence of.†	Average Order of Prevalence where Present.†,‡	Av. Daily Range by Registering Thermometers.	Average of Three Daily Observations.	Relative, Per Cent of Saturation.	Absolute,—Grains of Vapor in a Cubic Foot of Air.	Inhaled.‖	Exhaled in Excess of that Inhaled.¶		Day Observation, 7 A. M. to 2 P. M.	Night Observation, 9 P. M. to 7 A. M.		Range.		Average Pressure.
														Monthly, and for Year.	Average Daily, by Three Daily Observations.**	
More than Av. Per Ct. of Pneumonia.	Jan...	54	3.8	*a*17.72	15.14	80	1.09	.68	11.00	73	3.42	3.98	11.1	1.308	.307	29.274
	Feb...	49	3.8	*a*17.79	20.94	82	1.37	.86	10.82	78	3.36	4.31	*a*9.2	1.205	.232	*a*29.204
	Mar...	43	4.2	19.88	28.78	77	1.77	1.11	10.57	58	3.03	3.74	*a*8.8	1.122	.277	*a*29.202
	April.	39	3.7	19.22	42.00	*a*67	2.42	1.51	10.17	*a*53	2.90	*a*3.09	10.1	1.260	*a*.205	*a*29.147
	Dec...	34	4.7	*a*14.09	24.77	83	1.69	1.06	10.62	80	*a*2.62	*a*3.07	10.8	1.258	.281	29.229
Average.....		29	4.5	19.01	44.72	75	3.31	2.07	9.61	57	2.75	3.11	9.3	.976	.215	29.205
Less than Av. Per Cent of Pneumonia.	Nov...	29	5.2	16.37	*b*34.53	*a*79	*b*2.11	1.32	10.36	*a*62	2.40	2.80	*a*10.3	*a*1.019	*a*.232	*a*29.213
	May...	24	4.6	*a*19.50	54.38	70	3.78	2.36	9.32	52	*a*2.91	*a*3.28	*a*9.4	.828	.177	29.131
	Oct...	21	5.3	18.69	51.56	*a*75	3.72	2.33	9.35	55	2.33	2.74	*a*10.5	.787	.203	*a*29.268
	June..	18	5.1	*a*21.90	67.04	73	5.59	3.49	8.19	40	2.64	2.70	6.8	.659	.116	*a*29.273
	July..	16	4.9	*a*20.83	66.70	71	5.40	3.38	8.30	48	2.50	2.57	7.9	.571	.127	29.100
	Aug...	11	6.2	*a*21.27	66.10	73	5.52	3.45	8.23	41	2.62	2.62	7.9	.731	.154	*a*29.216
	Sept...	10	6.5	*a*20.87	64.72	73	5.24	3.28	8.40	42	2.28	2.42	9.0	.967	.103	*a*29.210
MEMBRANOUS CROUP.																
More than Av. Per Ct. of Mem. Croup.	Dec...	10	5.6	*a*14.09	24.77	83	1.69	1.06	10.62	80	*a*2.62	*a*3.07	10.8	1.258	.281	29.229
	Feb...	10	6.4	*a*17.79	20.94	82	1.37	.86	10.82	78	3.36	4.31	*a*9.2	1.205	.232	*a*29.204
	Nov...	10	6.5	*a*16.37	34.53	79	2.11	1.32	10.36	62	*a*2.40	*a*2.80	10.3	1.019	.232	29.213
	Oct...	7	7.6	*a*18.69	*b*51.56	75	*b*3.72	2.33	9.35	*a*55	*a*2.33	*a*2.74	10.5	*a*.787	*a*.203	29.268
	Jan...	7	6.2	*a*17.72	15.14	80	1.09	.68	11.00	73	3.42	3.98	11.1	1.308	.307	29.274
Average.....		6	7.1	19.01	44.72	75	3.31	2.07	9.61	57	2.75	3.11	9.3	.976	.215	29.205
Less than Av. Per Cent of Membranous Croup.	May...	5	6.7	*a*19.50	54.38	70	3.78	2.36	9.32	52	*a*2.91	*a*3.28	*a*9.4	.828	.177	29.131
	Sept...	5	9.4	*a*20.87	64.72	73	5.24	3.28	8.40	42	2.28	2.42	9.0	.967	.103	*a*29.210
	Mar...	5	8.6	*a*19.88	*b*28.78	*a*77	*b*1.77	1.11	10.57	*a*58	*a*3.03	*a*3.74	8.8	*a*1.122	*a*.277	29.202
	Aug...	4	9.5	*a*21.27	66.10	73	5.52	3.45	8.23	41	2.62	2.62	7.9	.731	.154	*a*29.216
	June.	4	8.7	*a*21.90	67.04	73	5.59	3.49	8.19	40	2.64	2.70	6.8	.659	.116	*a*29.273
	Apr...	4	5.7	*a*19.22	*b*42.00	67	*b*2.42	1.51	10.17	53	*a*2.90	3.09	*a*10.1	*a*1.260	.205	29.147
	July..	4	10.2	*a*20.83	66.70	71	5.40	3.38	8.30	48	2.50	2.57	7.9	.571	.127	29.100

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*, †, ‡, §, ‖, ¶, **. See foot-notes with these marks in Exhibit VIII, page 124.

a Exceptions to Proposition 1, relating to Pneumonia and Membranous Croup, on page 125.

b Exceptions to Proposition 2, relating to Pneumonia and Membranous Croup, on page 125.

EXHIBIT XI.—*By Year and Months for 1884 and an Average for the Eight Years 1877–84,* Stating on what Per Cent of the Weekly Reports received* PNEUMONIA, MEMBRANOUS CROUP, DIPHTHERIA, RHEUMATISM, INFLUENZA, SCARLET FEVER, TONSILITIS,* AND NEURALGIA* *were Reported Present, and Comparing the Per Cents for Months in 1884 with the Averages for Corresponding Months in those years.*†

	Year and Months.	Year.	Jan.	Feb.	March.	April.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.		Year.	Jan.	Feb.	March.	April.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
Pneumonia.	Av. 8 years, 1877-84	39	62	66	62	56	42	27	17	14	18	23	36	48	Membranous Croup.	7	12	10	8	7	5	4	2	3	4	6	9	11
	1883	38	56	62	64	55	46	27	16	16	21	23	34	44		6	9	10	6	7	6	5	3	4	5	5	7	7
	1884	29	54	49	43	39	24	18	16	11	10	21	29	34		6	7	10	5	4	5	4	4	4	5	7	10	10
	In 1884 **Greater** than Av. 1877-84	..	..	..	..	..	..	..	..	..	..	..	..	..		..	..	=	..	..	=	=	2	1	1	1	1	..
	In 1884 **Less** than Av. 1877-84.	10	8	17	19	17	18	9	1	3	8	2	7	14		1	5	..	3	3	..	..	..	..	..	..	..	1
Diphtheria.	Av. 8 years, 1877-84	24	31	27	23	22	19	16	16	17	20	28	32	31	Rheumatism.	69	73	73	73	74	71	67	61	57	60	67	72	74
	1883	17	26	21	19	16	15	14	15	13	12	15	22	15		68	77	71	70	80	77	69	64	57	55	62	69	70
	1884	15	17	13	16	12	17	13	8	14	10	18	19	20		70	65	67	70	75	77	73	67	68	67	67	71	76
	In 1884 **Greater** than Av. 1877-84	..	..	..	..	..	..	..	..	..	..	..	..	..		1	..	..	..	1	6	6	6	11	7	=	..	2
	In 1884 **Less** than Av. 1877-84.	9	14	14	7	10	2	3	8	3	10	10	13	11		..	8	6	3	..	..	..	..	..	..	..	1	..
Influenza.	Av. 8 years, 1877-84	41	56	62	60	53	40	29	21	25	29	34	42	50	Scarlatina.	20	25	26	26	24	21	18	15	13	14	17	19	20
	1883	43	51	62	71	60	50	33	24	21	26	35	39	47		19	22	21	24	23	22	18	17	13	16	17	22	17
	1884	41	55	51	50	49	42	30	27	47	34	37	42	49		16	19	25	28	22	25	14	12	12	9	9	10	15
	In 1884 **Greater** than Av. 1877-84	=	..	..	..	..	2	1	6	22	5	3	=	..		..	..	..	2	2	4	..	..	..	..	..	..	..
	In 1884 **Less** than Av. 1877-84.	..	1	11	10	4	..	..	..	..	..	..	..	1		4	6	1	..	..	..	4	3	1	5	8	9	5
Tonsilitis.*	Av. 6 years, 1879-84	48	50	62	59	53	47	42	32	31	36	45	55	60	Neuralgia.*	66	67	70	72	72	67	65	59	57	59	63	69	69
	1883	50	64	61	61	58	54	41	36	35	43	48	55	54		69	77	75	75	78	73	68	64	59	62	64	65	68
	1884	50	53	59	56	53	52	45	38	38	39	48	59	57		70	69	73	74	76	74	67	68	64	63	68	74	73
	In 1883 **Greater** than Av. 1879-84	2	..	..	..	=	5	3	6	7	3	3	4	..		4	2	3	2	4	7	2	9	7	4	5	5	4
	In 1884 **Less** than Av. 1879-84.	..	6	3	3	..	..	..	..	..	..	..	..	3		..	..	..	..	..	..	..	..	..	..	..	..	..

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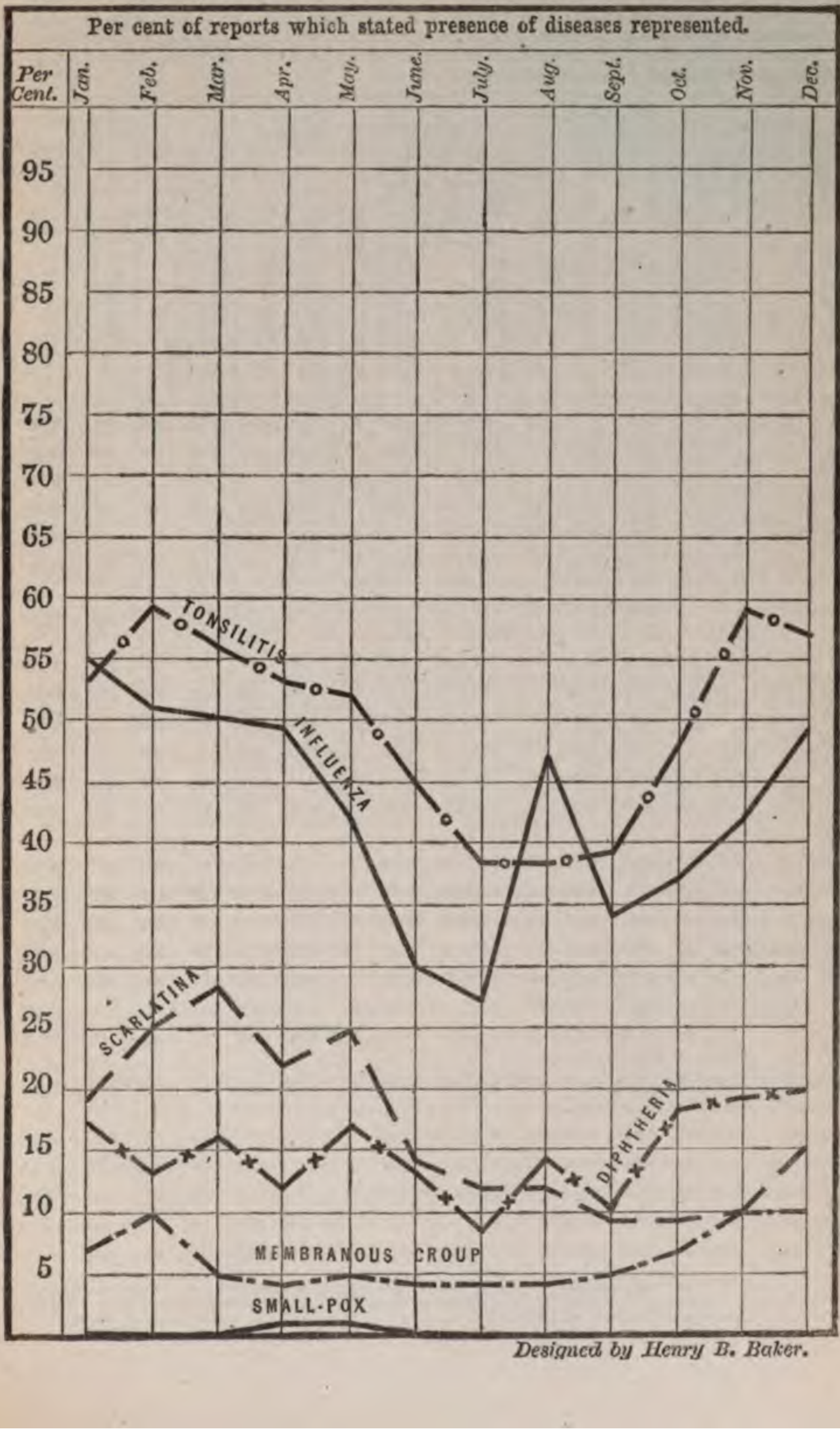
* The average line for tonsilitis and neuralgia includes only the six years, 1879-84.

† Other statements for 1884 and months in 1884 relative to these diseases are given in Table 2, pages 100-101, and in Exhibits X, XII, XIII, and XIV, pages 127,130 , 131, and 132, where are also given for convenient comparison statements of coincident meteorological conditions. The lines for 1884 are graphically represented in Diagrams 1, page 95, 2, page 129, and 4 on a following page.

DIAGRAM 2.—WEEKLY REPORTS OF DISEASES IN MICHIGAN, IN 1884.



Designed by Henry B. Baker.

EXHIBIT XII.—DIPHTHERIA AND TONSILITIS.—*Stating for the Year and for each Month of the Year 1884, what Per Cent of the Weekly Reports of Diseases Stated Presence of Diphtheria, also of Tonsilitis, and what were the Meteorological Conditions, as observed at Stations in Michigan.* *

DIPHTHERIA.				Temperature, F.		Humidity of Air.§ Av. of 3 Daily Observations.		Vapor Inhaled and Exhaled, from Air Passages, by 1 Person in 24 Hours. Troy Ozs.			Ozone,—Relative Scale of 10.°			Atmospheric Pressure. Inches. Reduced to 32° F.		
														Range.		
Months in Order of Greatest Per Cent of Weekly Reports Stating Presence of.		Per Cent of Weekly Reports Stating Presence of.†	Av. Order of Prevalence where Present. †, ‡.	Av. Daily Range, by Registering Thermometers.	Av. of Three Daily Observations.	Relative Per Cent of Saturation.	Absolute,—Grs. of Vapor in a Cu. Ft. of Air.	Inhaled. ‖	Exhaled, in Excess of that Inhaled. ¶	Av. Per Cent of Cloudiness.	Day Observation, 7 A. M. to 2 P. M.	Night Observation, 9 P. M. to 7 A. M.	Av. Velocity of Wind, Miles per Hour, by Anemometer.	Monthly, and for Year.	Av. Daily, by 3 Daily Observations.**	Average Pressure.
More than Av. Per Ct. of Diphtheria.	Dec....	20	4.1	a 14.09	24.77	83	1.69	1.06	10.62	80	a 2.62	3.07	10.8	1.258	.281	29.229
	Nov....	19	4.3	a 16.37	34.53	79	2.11	1.32	10.36	62	a 2.40	a 2.80	10.3	1.019	.232	29.213
	Oct.....	18	4.9	a 18.69	b 51.56	75	b 3.72	2.33	9.35	a 55	a 2.33	a 2.74	10.5	a .787	a .203	29.268
	Jan....	17	5.1	a 17.72	15.14	80	1.09	.68	11.00	73	3.42	3.98	11.1	1.308	.307	29.274
	May....	17	4.6	19.50	b 54.38	a 70	b 3.78	2.36	9.32	a 52	2.91	3.28	9.4	a .828	a .177	a 29.131
	Mar....	16	5.3	19.88	28.78	77	1.77	1.11	10.57	58	3.03	3.74	a 8.8	1.122	.277	a 29.202
Average.....		15	5.1	19.01	44.72	75	3.31	2.07	9.61	57	2.75	3.11	9.3	.976	.215	29.205
Less than Av. Per Ct. of Diphtheria.	Aug....	14	6.8	a 21.27	66.10	73	5.52	3.45	8.23	41	2.62	2.62	7.9	.731	.154	a 29.216
	June..	13	5.4	a 21.90	67.04	73	5.59	3.49	8.19	40	2.64	2.70	6.8	.659	.116	a 29.273
	Feb....	13	5.9	17.79	b 20.94	a 82	b 1.37	.86	10.82	a 78	a 3.36	a 4.31	9.2	a1.205	a .232	29.204
	April..	12	4.1	a 19.22	b 42.00	67	b 2.42	1.51	10.17	53	a 2.90	3.09	a 10.1	a1.260	.205	29.147
	Sept....	10	5.5	a 20.87	64.72	73	5.24	3.28	8.40	42	2.28	2.42	9.0	.967	.103	a 29.210
	July...	8	6.5	a 20.83	66.70	71	5.40	3.38	8.30	48	2.50	2.57	7.9	.571	.127	29.100
TONSILITIS.																
More than Av. Per Cent of Tonsilitis.	Feb....	59	3.4	a 17.79	20.94	82	1.37	.86	10.82	78	3.36	4.31	a 9.2	1.205	.232	a 29.204
	Nov....	58	3.5	a 16.37	34.53	79	2.11	1.32	10.36	62	a 2.40	a 2.80	10.3	1.019	.232	29.213
	Dec....	57	3.0	a 14.09	24.77	83	1.69	1.06	10.62	80	a 2.62	a 3.07	10.8	1.251	.281	29.229
	Mar....	56	3.4	19.88	28.78	77	1.77	1.11	10.57	58	3.03	3.74	a 8.8	1.122	.277	a 29.202
	Jan....	53	3.6	a 17.72	15.14	80	1.09	.68	11.00	73	3.42	3.98	11.1	1.308	.307	29.274
	April..	53	3.3	19.22	42.00	a 67	2.42	1.51	10.17	a 53	2.90	a 3.09	10.1	1.260	a .205	a 29.147
	May...	52	3.6	19.50	b 54.38	a 70	b 3.78	2.36	9.32	a 52	2.91	3.28	9.4	a .828	a .177	a 29.131
Average.....		50	3.7	19.01	44.72	75	3.31	2.07	9.61	57	2.75	3.11	9.3	.976	.215	29.205
Less than Av. Per Ct. of Tonsilitis.	Oct....	48	4.0	18.69	51.56	a 75	3.72	2.33	9.35	55	2.33	2.74	a 10.5	.787	.203	a 29.268
	June..	45	3.7	a 21.90	67.04	73	5.59	3.49	8.19	40	2.64	2.70	6.8	.659	.116	a 29.273
	Sept....	39	4.8	a 20.87	64.72	73	5.24	3.28	8.40	42	2.28	2.42	9.0	.967	.103	a 29.210
	Aug....	38	4.9	a 21.27	66.10	73	5.52	3.45	8.23	41	2.62	2.62	7.9	.731	.154	a 29.216
	July...	38	4.2	a 20.83	66.70	71	5.40	3.38	8.30	48	2.50	2.57	7.9	.571	.127	29.100

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*, †, ‡, §, ‖, ¶, ** See footnotes with these marks in Exhibit VIII, page 124. *a* Exceptions to Proposition 1, relating to diphtheria and tonsilitis, on page 125. *b* Exceptions to proposition 2, relating to diphtheria and tonsilitis, on page 125.

EXHIBIT XIII.—INFLUENZA AND SCARLET FEVER.—*Stating for the Year and for each Month of the Year 1884, what Per Cent. of the Weekly Reports of Diseases Stated Presence of Influenza; also of Scarlet Fever, and what were the Meteorological Conditions, as Observed at Stations in Michigan.**

INFLUENZA.				Temperature, F.		Humidity of Air§ Av. of 3 Daily Observations.		Vapor Inhaled and Exhaled from Air Passages, by one Person in 24 Hours. Troy Ozs.			Ozone,—Relative. Scale of 10°.			Atmospheric Pressure. Inches. Reduced to 32° F.		
														Range.		
	Months in Order of Greatest Per Cent. of Weekly Reports Stating Presence of.	Per Cent of Weekly Reports Stating Presence of.†	Average Order of Prevalence where Present.†, ‡	Av. Daily Range, by Registering Thermometers.	Average of Three Daily Observations.	Relative Per Ct. of Saturation.	Absolute,—Grs. of Vapor in a Cubic Foot of Air.	Inhaled.‖	Exhaled, in Excess of that Inhaled.¶	Average Per Cent of Cloudiness.	Day Observation, 7 A. M. to 2 P. M.	Night Observation, 9 P. M. to 7 A. M.	Average Velocity of Wind, Miles Per Hour, by Anemometer.	Monthly, and for Year.	Av. Daily, by 3 Daily Observations.**	Average Pressure.
More than Av. Per Cent of Influenza.	Jan.	55	2.5	a17.72	15.14	80	1.09	.68	11.00	73	3.42	3.98	11.1	1.308	.307	29.274
	Feb.	51	2.4	a17.79	20.94	82	1.37	.86	10.82	78	3.36	4.31	a 9.2	1.205	.232	a29.204
	March	50	2.7	19.88	28.78	77	1.77	1.11	10.57	58	3.03	3.74	a 8.8	1.122	.277	a29.202
	Dec.	49	2.8	a14.09	24.77	83	1.69	1.06	10.62	80	a 2.62	a 3.07	10.8	1.258	.281	29.229
	April	49	2.8	19.22	42.00	a 67	2.42	1.51	10.17	a 53	2.90	a 3.09	10.1	1.260	a .205	a29.147
	August	47	4.7	21.27	b66.10	a 73	b 5.52	3.45	8.23	a 41	a 2.62	a 2.62	a 7.9	a .731	a .154	29.216
	May	42	3.3	19.50	b54.38	a 70	b 3.78	2.36	9.32	a 52	2.91	3.28	9.4	a .828	a .177	a29.131
Average		41	3.3	19.01	44.72	75	3.31	2.07	9.61	57	2.75	3.11	9.3	.976	.215	29.205
Less than Av. Per Ct. of Influenza.	Nov.	41	3.2	16.37	b34.53	a 79	b 2.11	1.32	10.36	a 62	2.40	2.80	a 10.3	a1.019	a .232	a29.213
	Oct.	37	3.7	18.69	51.56	a 75	3.72	2.33	9.35	55	2.33	2.74	a 10.5	.787	.203	a29.268
	Sept.	34	4.4	a20.87	64.72	73	5.24	3.28	8.40	42	2.28	2.42	9.0	.967	.103	a29.210
	June	30	4.4	a21.90	67.04	73	5.59	3.49	8.19	40	2.64	2.70	6.8	.659	.116	a29.273
	July	27	4.3	a20.83	66.70	71	5.40	3.38	8.30	48	2.50	2.57	7.9	.571	.127	29.100
SCARLET FEVER.																
More than Av. Per Ct. of Scarlatina.	March	28	4.4	19.88	28.78	77	1.77	1.11	10.57	58	3.03	3.74	a 8.8	1.122	.277	a29.202
	Feb.	25	4.8	a17.79	20.94	82	1.37	.86	10.82	78	3.36	4.31	a 9.2	1.205	.232	a29.204
	May	25	4.8	19.50	b54.38	a 70	b 3.78	2.36	9.32	a 52	2.91	3.28	9.4	a .828	a .177	a29.131
	April	22	4.2	19.22	42.00	a 67	2.42	1.51	10.17	a 53	2.90	a 3.09	10.1	1.260	a .205	a29.147
	Jan.	19	4.9	a17.72	15.14	80	1.09	.68	11.00	73	3.42	3.98	11.1	1.308	.307	29.274
Average		16	5.2	19.01	44.72	75	3.31	2.07	9.61	57	c 2.75	3.11	9.3	.976	.215	29.205
Less than Av. Per Ct. of Scarlatina.	December.	15	6.5	14.09	b24.77	a 83	b 1.69	1.06	10.62	a 80	2.62	3.07	a 10.8	a1.258	a .281	a29.229
	June	14	5.2	a21.90	67.04	73	5.59	3.49	8.19	40	2.64	2.70	6.8	.659	.116	a29.273
	Aug.	12	6.4	a21.27	66.10	73	5.52	3.45	8.23	41	2.62	2.62	7.9	.731	.154	a29.216
	July	12	4.8	a20.83	66.70	71	5.40	3.38	8.30	48	2.50	2.57	7.9	.571	.127	29.100
	Nov.	10	7.4	16.37	b34.53	a 79	b 2.11	1.32	10.36	a 62	2.40	2.80	a 10.3	a1.019	a .232	a29.213
	Oct.	9	5.6	18.69	51.56	a 75	3.72	2.33	9.35	55	2.33	2.74	a 10.5	.787	.203	a29,268
	Sept.	9	6.0	a20.87	64.72	73	5.24	3.28	8.40	42	2.28	2.42	9.0	.967	.103	a29.210

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*, †, ‡, §, ‖, ¶, **. See footnotes with these marks in Exhibit VIII, page 124.

a Exceptions to Proposition 1, relating to influenza and scarlet fever, on page 125.

b Exceptions to Proposition 2, relating to influenza and scarlet fever, on page 125.

c As regards day ozone, there is, for 1884, no exception to proposition 1, relating to scarlatina.

EXHIBIT XIV.—RHEUMATISM AND NEURALGIA.—*Stating for the Year and for each Month of the Year 1884, what Per Cent of the Weekly Reports of Diseases Stated Presence of Rheumatism, also of Neuralgia, and what were the Meteorological Conditions, as Observed at Stations in Michigan.**

RHEUMATISM.				Temperature, F.		Humidity of Air.§ Av. of 3 Daily Observations.		Vapor Inhaled and Exhaled from Air Passages, by one person in 24 hours. Troy Ozs.		Average Per Cent of Cloudiness.	Ozone.—Relative Scale of 10°.		Average Velocity of Wind, Miles per hour, by Anemometer.	Atmospheric Pressure, Inches. Reduced to 32° F.		
														Range.		
Months in Order of Greatest Per Cent of Weekly Reports Stating Presence of.		Per Cent of Weekly Reports Stating Presence of.†	Average Order of Prevalence where Present.†,‡	Average Daily Range by Registering Thermometers.	Average of three Daily Observations.	Relative Per Cent of Saturation.	Absolute—Grains of Vapor in Cubic Foot of Air.	Inhaled.‖	Exhaled in excess of that Inhaled.¶		Day Observation, 7 A. M. to 2 P. M.	Night Observation, 9 P. M. to 7 A. M.		Monthly and for year.	Average Daily, by three Daily Observations.**	Average Pressure.
More than Av. Per Cent of Rheumatism.	May	77	3.3	19.50	*b*54.38	*a*70	*b*3.78	2.36	9.32	*a*52	2.91	3.28	9.4	*a*.828	*a*.177	*a*29.131
	December	76	3.3	*a*14.09	24.77	83	1.69	1.06	10.62	80	*a*2.62	*a*3.07	10.8	1.258	.281	29.229
	April	75	3.4	19.22	42.00	*a*67	2.42	1.51	10.17	*a*53	2.90	*a*3.09	10.1	1.260	*a*.205	*a*29.147
	June	73	3.1	21.90	*b*67.04	*a*73	*b*5.59	3.49	8.19	*a*40	*a*2.64	*a*2.70	*a*6.8	*a*.659	*a*.116	29.273
	November	70	3.4	*a*16.37	34.53	79	2.11	1.32	10.36	62	*a*2.40	*a*2.80	10.3	1.019	.232	29.213
Average		70	3.6	19.01	44.72	75	3.31	2.07	9.61	57	2.75	3.11	9.3	.976	.215	29.205
Less than Average Per Cent of Rheumatism.	March	70	3.7	*a*19.88	*b*28.78	*a*77	*b*1.77	1.11	10.57	*a*58	*a*3.03	*a*3.74	8.8	*a*1.122	*a*.277	29.202
	August	68	4.2	*a*21.27	66.10	73	5.52	3.45	8.23	41	2.62	2.62	7.9	.731	.154	*a*29.216
	October	67	3.7	18.69	51.56	*a*75	3.72	2.33	9.35	55	2.33	2.74	*a*10.5	.787	.203	*a*29.268
	February	67	3.6	17.79	*b*20.94	*a*82	*b*1.37	.86	10.82	*a*78	*a*3.36	*a*4.31	9.2	*a*1.205	*a*.232	29.204
	September	67	4.5	*a*20.87	64.72	73	5.24	3.28	8.40	42	2.28	2.42	9.0	.967	.103	*a*29.210
	July	67	3.7	*a*20.83	66.70	71	5.40	3.38	8.30	48	2.50	2.57	7.9	.571	.127	29.100
	January	65	3.6	17.72	*b*15.14	*a*80	*b*1.09	.68	11.00	*a*73	*a*3.42	*a*3.98	*a*11.1	*a*1.308	*a*.307	*a*29.274
NEURALGIA.																
More than Av. Per Cent of Neuralgia.	April	76	....	19.22	42.00	*a*67	2.42	1.51	10.17	*a*53	2.90	*a*3.09	10.1	1.260	*a*.205	*a*29.147
	March	74	....	19.88	28.78	77	1.77	1.11	10.57	58	3.03	3.74	*a*8.8	1.122	.277	*a*29.202
	May	74	....	19.50	*b*54.38	*a*70	*b*3.78	2.36	9.32	*a*52	2.91	3.28	9.4	*a*.828	*a*.177	*a*29.131
	February	73	....	*a*17.79	20.94	82	1.37	.86	10.82	78	3.36	4.31	*a*9.2	1.205	.232	*a*29.204
	December	73	....	*a*14.09	24.77	83	1.69	1.06	10.62	80	*a*2.62	*a*3.07	10.8	1.258	.281	29.229
	November	73	....	*a*16.37	34.53	79	2.11	1.32	10.36	62	*a*2.40	*a*2.80	10.3	1.019	.232	29.213
Average		70	....	19.01	44.72	75	3.31	2.07	9.61	57	2.75	3.11	9.3	.976	2.15	29.205
Less than Av. Per Cent of Neuralgia.	January	69	....	17.72	*b*15.14	*a*80	*b*1.09	.68	11.00	*a*73	*a*3.42	*a*3.98	*a*11.1	*a*1.308	*a*.307	*a*29.274
	July	68	....	*a*20.83	66.70	71	5.40	3.38	8.30	48	2.50	2.57	7.9	.571	.127	29.100
	October	68	....	18.69	51.56	*a*75	3.72	2.33	9.35	55	2.33	2.74	*a*10.5	.787	.203	*a*29.268
	June	67	....	*a*21.90	67.04	73	5.59	3.49	8.19	40	2.64	2.70	6.8	.659	.116	*a*29.273
	August	64	....	*a*21.27	66.10	73	5.52	3.45	8.23	41	2.62	2.62	7.9	.731	.154	*a*29.216
	September	63	....	*a*20.87	64.72	73	5.24	3.28	8.40	42	2.28	2.42	9.0	.967	.103	*a*29.210

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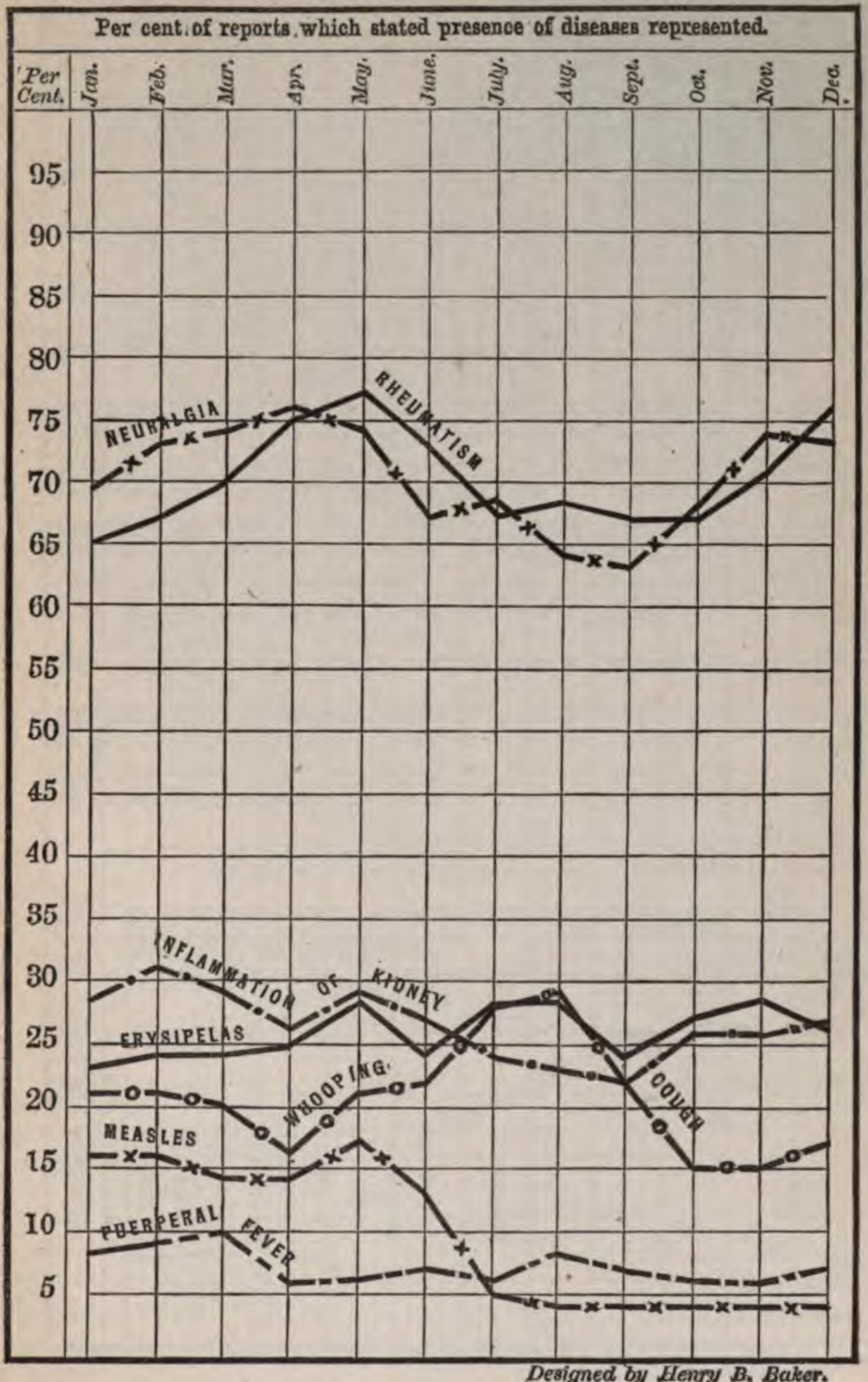
*, †, ‡, §, ‖, ¶, **. See foot-notes with these marks in Exhibit VIII, page 124.
a. Exceptions to Proposition 1, relating to Rheumatism and Neuralgia, on page 125.
b. Exceptions to Proposition 2, relating to Rheumatism and Neuralgia, on page 125.

DIAGRAM 4.—WEEKLY REPORTS OF DISEASES IN MICHIGAN. IN 1884.



Designed by Henry B. Baker.

EXHIBIT XV.—PULMONARY CONSUMPTION.—*Stating for the Year and for each Month of the Year 1884, what Per Cent. of the Weekly Reports of Diseases stated presence of Pulmonary Consumption, and what were the Meteorological Conditions, as Observed at Stations in Michigan.**

CONSUMPTION.				Temperature, F.		Humidity of Air.§ Av. of Three Daily Observat'ns.		Vapor Inhaled and Exhaled from Air Passages, by one Person in 24 Hours. Troy Ounces.			Ozone,—Relative. Scale of 10.¶			Atmospheric Pressure. Inches. Reduced to 32° F.		
														Range.		
Months in Order of Greatest Per Cent. of Weekly Reports Stating Presence of.		Per Cent. of Weekly Reports Stating Presence of.†	Av. Order of Prevalence where Present.†‡	Av. Daily Range, by Registering Thermometers.	Av. of Three Daily Observations.	Relative Per Cent. of Saturation.	Absolute—Grains of Vapor in a Cubic Foot of Air.	Inhaled.‖	Exhaled in Excess of that Inhaled.¶	Av. Per Cent. of Cloudiness.	Day Observation, 7 A. M. to 2 P. M.	Night Observation, 9 P. M. to 7 A. M.	Av. Velocity of Wind, Miles per Hour, by Anemometer.	Monthly and for Year.	Av. Daily, by Three Daily Observa'ns.**	Average Pressure.
More than Average Per Cent. of Consumption.	April	70	3.9	19.22	42.00	*a*67	2.42	1.51	10.17	*a*53	2.90	*a*3.09	10.1	1.260	*a*.205	*a*29.147
	May	67	4.2	19.50	*b*54.38	*a*70	*b*3.78	2.36	9.32	*a*52	2.91	3.28	9.4	*a*.828	*a*.177	*a*29.131
	Mar.	66	4.3	19.88	28.78	77	1.77	1.11	10.57	58	3.03	3.74	*a*8.8	1.122	.277	*a*29.202
	Oct.	65	4.4	*a*18.69	*b*51.56	75	*b*3.72	2.33	9.35	*a*55	*a*2.33	*a*2.74	10.5	*a*.787	*a*.203	29.268
	June.	65	3.9	21.90	*b*67.04	*a*73	*b*5.59	3.49	8.19	*a*40	*a*2.64	*a*2.70	*a*6.8	*a*.659	*a*.116	29.273
	Aug.	63	4.8	21.27	*b*66.10	*a*73	*b*5.52	3.45	8.23	*a*41	*a*2.62	*a*2.62	*a*7.9	*a*.731	*a*.154	29.216
	July.	63	4.1	20.83	*b*66.70	*a*71	*b*5.40	3.38	8.30	*a*48	*a*2.50	*a*2.57	*a*7.9	*a*.571	*a*.127	*a*29.100
	Sept.	63	5.1	20.87	*b*64.72	*a*73	*b*5.24	3.28	8.40	*a* 42	*a*2.28	*a*2.42	*a*9.0	*a*.967	*a*.103	29.210
Average		63	4.3	19.01	44.72	75	3.31	2.07	9.61	57	2.75	3.11	9.3	.976	.215	29.205
Less than Av. Per Cent. of Consumption.	Feb.	61	4.6	17.79	*b*20.94	*a*82	*b*1.37	.86	10.82	*a*78	*a*3.36	*a*4.31	9.2	*a*.205	*a*.232	29.203
	Nov.	60	4.2	16.37	*b*34.53	*a*79	*b*2.11	1.32	10.36	*a*62	2.40	2.80	*a*10.3	*a*1.019	*a*.232	*a*29.213
	Dec.	58	4.2	14.09	*b*24.77	*a*83	*b*1.69	1.06	10.62	*a*80	2.62	3.07	*a*10.8	*a*1.258	*a*.281	*a*29.229
	Jan.	56	4.5	17.72	*b*15.14	*a*80	*b*1.09	.68	11.00	*a*73	*a*3.42	*a*3.98	*a*11.1	*a*1.308	*a*.307	*a*29.274

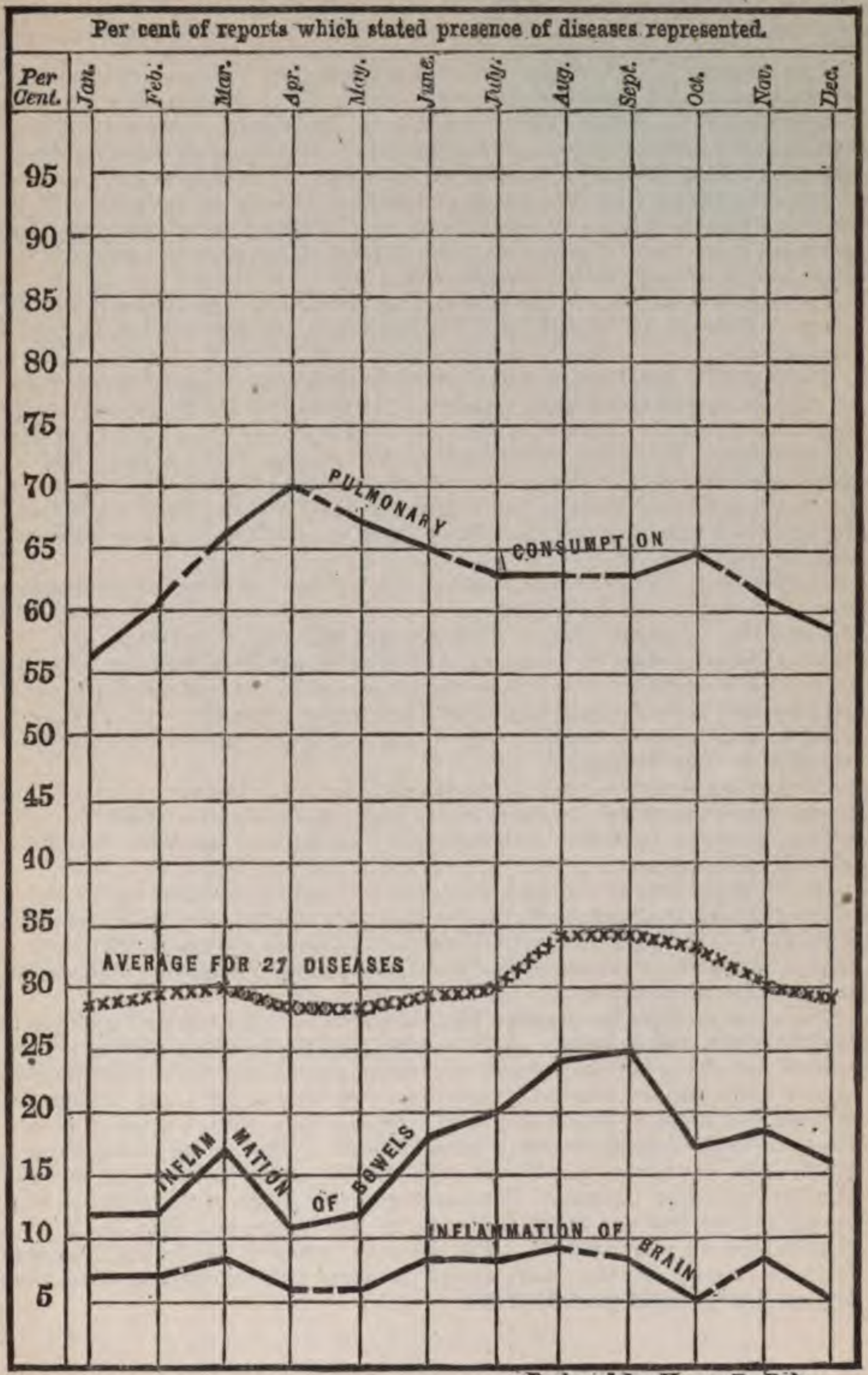
*, †, ‡, §, ‖, ¶, **. See foot-notes with these marks in Exhibit VIII, page 124.
a. Exceptions to Proposition 1, relating to Pulmonary Consumption, on page 125.
b. Exceptions to Proposition 2, relating to Pulmonary Consumption, on page 125.

EXHIBIT XVI.—SICKNESS FROM CONSUMPTION, 1878–84.—*By Year and Months for each of the Seven Years 1878–84, Stating on what Per Cent of the Weekly Reports received* CONSUMPTION *was Reported Present, and Comparing the Per Cents for 1884 with the Averages for Corresponding Months in those Years.*

Years, Etc.	Annual Av.	Jan.	Feb.	March.	April.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
Average for 7 Years 1878-84*	67	67	69	69	72	69	67	66	63	65	67	66	65
1877*	52	50	47	47	53	49	50	43	35	38	54	68	65
1878	71	67	72	76	75	72	68	68	65	70	73	73	71
1879	70	71	71	69	77	74	73	69	67	67	69	67	64
1880	68	65	69	70	72	70	69	66	62	66	66	68	70
1881	71	74	76	73	76	69	68	67	67	70	73	74	67
1882	66	66	68	66	66	69	66	67	63	63	65	62	65
1883	61	69	66	66	65	62	61	59	55	57	58	58	60
1884	63	56	61	66	70	67	65	63	63	63	65	61	58
In 1884 **Greater** than Av. '78-84	------	----	----	----	----	----	----	----	=	----	----	----	----
In 1884 **Less** than Av. 1878-84	4	11	8	3	2	2	2	3	----	2	2	5	7

* As consumption was not printed on the first blanks, nor on all used in 1877, that year is excluded *from the average line.*

DIAGRAM 5.—WEEKLY REPORTS OF DISEASES IN MICHIGAN, IN 1884.



Designed by Henry B. Baker.

RELATIONS OF DIARRHEA TO METEOROLOGICAL CONDITIONS.

PROPOSITION 1.—That in months when **more** than the average per cent of weekly reports stated the presence of diarrhea, the average daily range of temperature, the average daily temperature, the absolute humidity of the atmosphere, the monthly and the average daily range of the barometer, and the average daily pressure of the atmosphere were **greater** than the average for the year; and in months when **less** than the average per cent of reports stated the presence of diarrhea, these conditions were **less** than the average for the year. In Exhibit XVII, page 138, the letter *a* marks exceptions to this proposition for the year 1884.

Explanations of Propositions 1 and 2 are given on page 122, and a summary of the evidence in Exhibit XVII is given in Exhibit XXIII, on a following page.

PROPOSITION 2.—That in months when **more** than the average per cent of weekly reports stated the presence of diarrhea, the relative humidity of the atmosphere, the average per cent of cloudiness, the ozone, and the average velocity of the wind were **less** than the average for the year; and in months when **less** than the average per cent of reports stated the presence of diarrhea, these conditions were **greater** than the average for the year. In Exhibit XVII, page 138, the letter *b* marks exceptions to this proposition for 1884.

PROPOSITION 3.—For those months which are not, as regards the absolute humidity of the atmosphere, exceptions to Proposition 1, it is true also that the quantity of vapor inhaled daily was **greater** than the average, and the quantity exhaled daily in excess of that inhaled was **less** than the average in months when **more** than the average per cent of reports stated presence of diarrhea; and that **less** vapor was inhaled and a **greater** excess exhaled daily in months when the per cent of reports stating presence of diarrhea was **less** than the average.

Proposition 3 is true also in relation to cholera infantum, intermittent fever, remittent fever, typhoid fever, typho-malarial fever, measles, and whooping-cough, treated in Exhibits XVII, XIX, XX, and XXI, page 138, and following pages.

On what per cent of the weekly reports received, by months, in the eight years, 1877–84, the eight foregoing diseases were reported present is stated in Exhibit XVIII, page 139. In Diagram 1, page 95, is graphically represented by months what per cent of the reports in each month in 1884 stated the presence of diarrhea.

The greatest sickness reported from diarrhea in 1884 was in September, August, July, and October. For the year 1884 the reports indicated an increased prevalence of diarrhea over the average for the eight years 1877-84, and also an increased prevalence for each month of the year 1884, except for the months of February, March and July. In February, 1884, the per cent was the same as the average for the 8 years 1877–84. The average temperature for the year was lower than the average for the eight years, except in September, June, and October. The average daily range of temperature was greater for the year and for each month in the year except May and April, than for the six years 1879–84. The absolute humidity was less in 1884 and for each month in the year, except in June and September, than the average for the eight years 1877–84.

RELATIONS OF CHOLERA INFANTUM AND OTHER "WARM WEATHER" DISEASES TO METEOROLOGICAL CONDITIONS.

PROPOSITION 1.—That in months when **more** than the average per cent of weekly reports stated the presence of cholera infantum (or of intermittent fever, remittent fever, typhoid fever, typho-malarial fever, measles, or whooping-cough), the average daily range of temperature, the average daily temperature, the absolute humidity of the atmosphere, the monthly and the average daily range of the barometer, and the average daily pressure of the atmosphere were **greater** than the average for the year; and in months when **less** than the average per cent of reports stated the presence of cholera infantum (or of the other diseases named), these conditions were **less** than the average for the year. In Exhibit XVII, page 138, the letter *a* marks exceptions to this proposition for the year 1884.

Explanations of Propositions 1 and 2 are given on page 122, and a summary of the evidence of Exhibit XVII is given in Exhibit XXIII, on a following page.

PROPOSITION 2.—That in months when **more** than the average per cent of weekly reports stated the presence of cholera infantum (or of intermittent fever, remittent fever, typhoid fever, typho-malarial fever, measles, or whooping-cough), the relative humidity of the atmosphere, the average per cent of cloudiness, the ozone, and the average velocity of the wind were **less** than the average for the year; and that in months when **less** than the average per cent of reports stated the presence of cholera infantum (or of the other diseases named), these conditions were **greater** than the average for the year. In Exhibit XVII, page 138, the letter *b* marks exceptions to this proposition for 1884.

What per cent of all the weekly reports of sickness in each month in 1884 stated presence of cholera infantum is graphically represented by months in Diagram 1, page 95. What per cent of the reports received, by months in the eight years 1877–84, stated presence of cholera infantum, and of the other diseases mentioned in the two preceding paragraphs, Propositions 1 and 2, is stated in Exhibit XVIII, page 139.

Cholera infantum was most prevalent during and immediately following the hot months,—September, August, July, and October being for 1884, the months from which more than the average sickness from this disease was reported. Compared with the average for the eight years 1877–84, there was a slight increase in sickness reported from cholera infantum for the year, and for each month in the year 1884, except in August, July, and January. The comparison of temperatures can be studied in Exhibit VII, page 138; the comparison of reported sickness from cholera infantum in Exhibit XVIII, page 139.

EXHIBIT XVII.—DIARRHEA AND CHOLERA INFANTUM.—*Stating for the Year and for each Month of the Year 1884, what Per Cent. of the Weekly Reports of Diseases Stated Presence of Diarrhea, also Cholera Infantum, and what were the Meteorological Conditions, as Observed at Stations in Michigan.**

DIARRHEA.				Temperature, F.		Humidity of Air.§ Av. of 3 Daily Observations.		Vapor Inhaled and Exhaled, from Air-passages, by one person in 24 hours, Troy Ozs.		Average Per Cent of Cloudiness.	Ozone,—Relative scale of 10°.		Average Velocity of Wind, Miles Per Hour, by Anemometer.	Atmospheric Pressure. Inches reduced to 32°. F.		
Months in Order of Greatest Per Cent. of Weekly Reports Stating Presence of.		Per Cent of Weekly Reports Stating Presence of.†	Average Order of Prevalence where Present.†,‡	Average Daily Range, by Registering Thermometers.	Average of 3 Daily Observations.	Relative Per Cent of Saturation.	Absolute,—Grains of Vapor in a Cubic Foot of Air.	Inhaled.‖	Exhaled, in excess of that inhaled.¶		Day Observation, 7 A. M. to 2 P. M.	Night Observation, 9 P. M. to 7 A. M.		Range.		Average Pressure.
														Monthly, and for Year.	Average Daily, by 3 Daily Observations.**	
More than Av. Per Cent of Diarrhea.	Sept.	88	1.9	20.87	64.72	73	5.24	3.28	8.40	42	2.28	2.42	9.0	a .967	a .103	29.210
	August	88	1.9	21.27	66.10	73	5.52	3.45	8.23	41	2.62	2.62	7.9	a .731	a .154	29.216
	July	73	2.3	20.83	66.70	71	5.40	3.38	8.30	48	2.50	2.57	7.9	a .571	a .127	a29.100
	October	70	2.5	a18.69	51.56	b 75	3.72	2.33	9.35	55	2.33	2.74	b 10.5	a .787	a .203	29.268
	June	52	3.5	21.90	67.04	73	5.59	3.49	8.19	40	2.64	2.70	6.8	a .659	a .116	29.273
Average		52	3.3	19.01	44.72	75	3.31	2.07	9.61	57	2.75	3.11	9.3	.976	.215	29.205
Less than Average Per Cent of Diarrhea.	Nov	46	4.0	16.37	34.53	79	2.11	1.32	10.36	62	b 2.40	b 2.80	10.3	a1.019	a .232	a29.213
	May	45	4.3	a19.50	a54.38	b 70	a 3.78	2.36	9.32	b 52	2.91	3.28	9.4	.828	.177	29.131
	April	38	4.4	a19.22	42.00	b 67	2.42	1.51	10.17	b 53	2.90	b 3.09	10.1	a1.260	.205	29.147
	Dec.	35	4.4	14.09	24.77	83	1.69	1.06	10.62	80	b 2.62	b 3.07	10.8	a1.258	a .281	a29.229
	January	28	4.6	17.72	15.14	80	1.09	.68	11.00	73	3.42	3.98	11.1	a1.308	a .307	a29.274
	Feb.	27	4.9	17.79	20.94	82	1.37	.86	10.82	78	3.36	4.31	b 9.2	a1.205	a .232	29.204
	March	26	4.8	a19.88	28.78	77	1.77	1.11	10.57	58	3.03	3.74	b 8.8	a1.122	a .277	29.202
CHOLERA INFANTUM.																
More than Av. per cent. of Cholera Infantum.	Sept	47	4.1	20.87	64.72	73	5.24	3.28	8.40	42	2.28	2.42	9.0	a .967	a .103	29.210
	Aug	43	3.5	21.27	66.10	73	5.52	3.45	8.23	41	2.62	2.62	7.9	a .731	a .154	29.216
	July	29	3.8	20.83	66.70	71	5.40	3.38	8.30	48	2.50	2.57	7.9	a .571	a .127	a29.100
	Oct.	22	4.9	a18.69	51.56	b 75	3.72	2.33	9.35	55	2.33	2.74	b 10.5	a .787	a .203	29.268
Average		15	4.8	19.01	44.72	75	3.31	2.07	9.61	57	2.75	3.11	9.3	.976	.215	29.205
Less than Average per cent. of Cholera Infantum.	June	14	5.6	a21.90	a67.04	b 73	a 5.59	3.49	8.19	b 40	b 2.64	b 2.70	b 6.8	.659	.116	a29.273
	Nov.	7	7.4	16.37	34.53	79	2.11	1.32	10.36	62	b 2.40	b 2.80	10.3	a1.019	a .232	a29.213
	April	6	7.1	a19.22	42.00	b 67	2.42	1.51	10.17	b 53	2.90	b 3.09	10.1	a1.260	.205	29.147
	May	5	7.4	a19.50	a54.38	b 70	a 3.78	2.36	9.32	b 52	2.91	3.28	9.4	.828	.177	29.131
	March	4	14.3	a19.88	28.78	77	1.77	1.11	10.57	58	3.03	3.74	b 8.8	a1.122	a .277	29.202
	Feb.	3	6.0	17.79	20.94	82	1.37	.86	10.82	78	3.36	4.31	b 9.2	a1.205	a .232	29.204
	Dec	3	5.6	14.09	24.77	83	1.69	1.06	10.62	80	b 2.62	b 3.07	10.8	a1.258	a .281	a29.229
	Jan.	1	8.0	17.72	15.14	80	1.09	.68	11.00	73	3.42	3.98	11.1	a1.308	a .307	a29.274

*, †, ‡, §, ‖, ¶, **. See footnotes with these marks in Exhibit VIII, page 139.

a. Exceptions to Proposition 1, relating to diarrhea and cholera infantum, on page 137.

b. Exceptions to Proposition 2, relating to diarrhea and cholera infantum, on page 137.

EXHIBIT XVIII.—*By Year and Months for 1884 and an Average for the Eight Years 1877–84, Stating on what Per Cent of the Weekly Reports received* DIARRHEA, CHOLERA INFANTUM, INTERMITTENT FEVER, REMITTENT FEVER, TYPHOID FEVER, TYPHO-MALARIAL FEVER, MEASLES, AND WHOOPING-COUGH *were Reported Present, and comparing the Per Cents for 1884 with the Averages for Corresponding Months in those Years.*

	Years, etc.	Year.	Jan.	Feb.	March.	April.	May.	June.	July.	August.	Sept.	Oct.	Nov.	Dec.		Year.	Jan.	Feb.	March.	April.	May.	June.	July.	August.	Sept.	Oct.	Nov.	Dec.
Diarrhea.	Av. 8 years, 1877-84	47	27	27	29	32	36	46	74	87	83	58	36	28	Cholera Infantum.	14	2	2	2	2	3	11	32	49	38	14	4	2
	1883	49	31	34	34	38	38	49	66	82	77	51	41	30		14	3	3	3	5	6	9	28	45	34	14	5	3
	1884	52	28	27	26	38	45	52	73	88	88	70	46	35		15	1	3	4	6	5	14	29	43	47	22	7	3
	In 1884 **Greater** than Av. 1877-84	5	1	=	..	6	9	6	..	1	5	12	10	7		1	..	1	2	4	2	3	..	..	9	8	3	1
	In 1884 **Less** than Av. 1877-84	..	..	..	3	..	..	..	1	..	..	..	..	..		..	1	..	..	..	..	..	3	6	..	..	..	..
Intermittent Fever.	Av. 8 years, 1877-84	76	61	63	66	75	83	84	86	86	86	84	74	65	Remittent Fever.	51	42	41	42	46	50	52	55	62	65	63	51	45
	1883	69	56	62	63	68	74	73	78	77	76	71	62	60		41	36	32	36	41	42	46	43	48	52	45	39	32
	1884	65	56	56	57	65	68	72	76	73	73	72	62	53		44	38	40	40	42	40	43	50	47	53	54	43	40
	In 1884 **Greater** than Av. 1877-84	..	..	..	..	..	..	..	..	..	..	..	..	..		..	..	..	..	..	..	..	..	..	..	..	..	..
	In 1884 **Less** than Av. 1877-84	11	5	7	9	10	15	12	10	13	13	12	12	12		7	4	1	2	4	10	9	5	15	12	9	8	5
Typhoid Fever.	Av. 8 years, 1877-84	13	12	9	7	6	6	6	7	14	22	24	23	17	Typho-malari'l Fever.	23	19	16	14	12	12	13	17	27	44	47	36	24
	1883	11	11	7	7	7	6	7	6	11	19	21	17	14		18	17	15	13	12	15	14	11	21	32	29	24	15
	1884	12	10	7	8	6	5	4	7	14	19	23	24	13		20	14	12	13	11	12	12	14	23	33	39	33	23
	In 1884 **Greater** than Av. 1877-84	..	..	..	1	=	..	..	=	=	..	..	1	..		..	..	..	..	1	=	1	3	4	..	..	..	..
	In 1884 **Less** than Av. 1877-84	1	2	2	..	..	1	2	..	..	3	1	..	4		3	5	4	1	..	..	..	..	..	1	8	3	1
Measles.	Av. 8 years, 1877-84	14	12	14	18	25	29	24	16	8	5	5	7	8	Whooping-cough.	21	21	21	20	18	20	21	23	23	22	19	21	21
	1883	24	18	20	28	45	51	42	26	12	9	10	14	12		15	14	14	14	16	17	13	12	14	14	14	17	19
	1884	10	16	16	14	14	17	13	5	4	4	4	4	4		23	21	21	20	16	21	22	28	29	22	15	15	17
	In 1884 **Greater** than Av. 1877-84	..	4	2	..	..	..	..	..	..	..	..	..	..		2	=	=	=	..	1	1	5	6	=	..	..	..
	In 1884 **Less** than Av. 1877-84	4	..	..	4	11	12	11	11	4	1	1	3	4		..	..	..	..	2	..	..	..	..	..	4	6	4

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[*] Other statements for 1884 and months in 1884 relative to these diseases are given in Table 2, pages 100-111, and in Exhibits XVII, XIX, XX, and XXI, pages 138, 141, 143, and 144, where are also given for convenient comparison statements of coincident meteorological conditions. The lines for 1884 are graphically represented in Diagrams 1, page 95, 3, page 142, and 4, page 133.

INTERMITTENT AND REMITTENT FEVER.

Exhibit IV in this and similar exhibits in previous Reports show a gradual decrease in remittent fever since 1878 until 1884, when an increase of 3 per cent of reports stating the presence of the disease over 1883 appears.

Exhibit XVIII indicates that for the year and for every month of the year 1884 intermittent and remittent fever were reported on a less per cent of reports than the average for the year and the corresponding months of the eight years 1877–84. Exhibit VII, page 121, shows that the average temperature except in June, September and October was below that of the corresponding months in the eight years 1877–84.

Without exception the months in 1884 in which more than the average (for the year) of intermittent fever was reported were the months in which the mean temperature was above the average for the year. Without exception they were the months in which the absolute humidity of the atmosphere was above the average for the year. In nine out of the twelve months the rule held that there was more than the average intermittent fever in months when the average daily range of temperature was greater than the average, and less than the average fever in months when the range of temperature was less than the average.

TYPHOID AND TYPHO-MALARIAL FEVER.

By Exhibit XVIII, page 139, relating to sickness from typhoid and typho-malarial fever, it will be seen that the average sickness from these diseases varies little from the monthly averages for the eight years 1877–85, being slightly less for the year and most of the months of the year. A study of the reported sickness from these diseases in connection with coincident weather by months in 1884 is given in Exhibit XX, page 143.

MEASLES AND WHOOPING-COUGH.

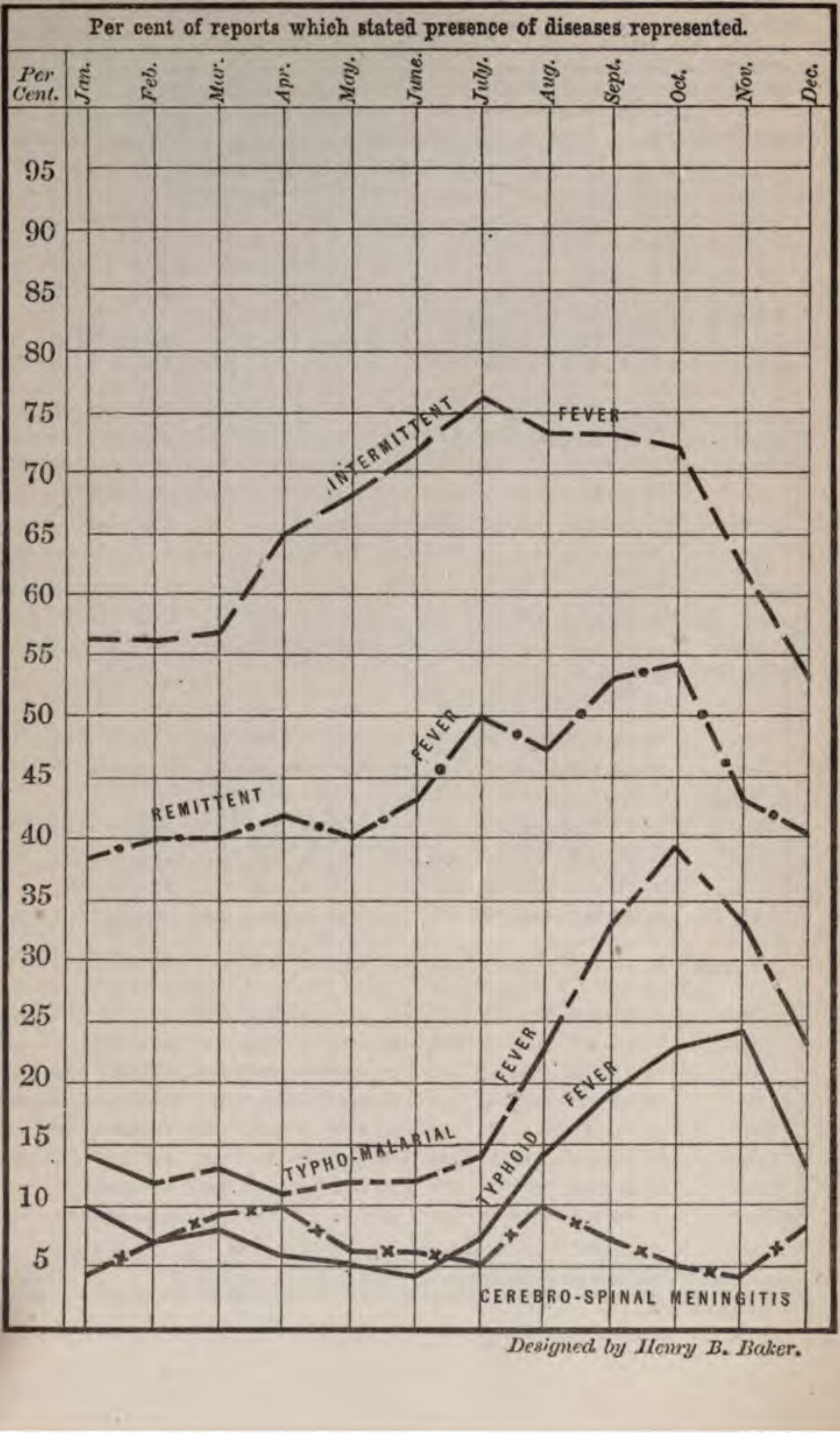
By Exhibit XVIII, it appears that measles, except for January and February, were less prevalent for the year and for each month of the year than the average for the eight years 1877–84. The same exhibit shows but little variation in whooping-cough as compared with the average for the eight years 1877–84. Both measles and whooping-cough are treated in Exhibit XXI, page 144.

EXHIBIT XIX.—INTERMITTENT FEVER AND REMITTENT FEVER.—*Stating for the Year and for each Month of the Year 1884, what Per Cent of the Weekly Reports of Diseases Stated Presence of Intermittent Fever, also of Remittent Fever, and what were the Meteorological Conditions, as Observed at Stations in Michigan.**

Intermittent Fever.				Temperature. F.		Humidity of Air.§ Av. of 3 Daily observations.		Vapor Inhaled and Exhaled from Air Passages by one Person in 24 Hours. (Troy Ozs.)		Average Per Cent of Cloudiness.	Ozone—Relative Scale of 10°.		Average Velocity of Wind, Miles per Hour, by Anemometer.	Atmospheric Pressure, Inches, Reduced to 32° F.		
														Range.		
	Months in Order of Greatest Per Cent of Weekly Reports Stating Presence of.	Per Cent of Weekly Reports Stating Presence of.†	Average Order of Prevalence where Present.†,‡	Av. Daily Range, by Registering Thermometers.	Av. of Three Daily Observations.	Relative Per Cent of Saturation.	Absolute — Grains of Vapor in a Cubic Foot of Air.	Inhaled.‖	Exhaled in Excess of that Inhaled.¶		Day Observation, 7 A. M. to 2 P. M.	Night Observation, 9 P. M. to 7 A. M.		Monthly, and for Years.	Average Daily, by 3 Daily Observations **	Average Pressure.
More than Av. Per Ct. of Intermittent Fever.	July	76	2.0	20.83	66.70	71	5.40	3.38	8.30	48	2.50	2.57	7.9	a .571	a .127	a 29.100
	Aug	73	2.4	21.27	66.10	73	5.52	3.45	8.23	41	2.62	2.62	7.9	a .731	a .154	29.216
	Sept	73	2.7	20.87	64.72	73	5.24	3.28	8.40	42	2.28	2.42	9.0	a .967	a .103	29.210
	Oct	72	2.2	a18.69	51.56	b 75	3.72	2.33	9.35	55	2.33	2.74	b 10.5	a .787	a .203	29.268
	June	72	2.2	21.90	67.04	73	5.59	3.49	8.19	40	2.64	2.70	6.8	a .659	a .116	29.273
	May	68	2.3	19.50	54.38	70	3.78	2.36	9.32	52	b 2.91	b 3.28	b 9.4	a .828	a .177	a 29.131
Average		65	2.5	19.01	c44.72	75	c 3.31	2.07	9.61	57	2.75	3.11	9.3	.976	.215	29.205
Less than Av. Per Ct. of Intermittent Fever.	Apr	65	2.2	a19.22	42.00	b 67	2.42	1.51	10.17	b 53	2.90	b 3.09	10.1	a1.260	.205	29.147
	Nov	61	2.4	16.37	34.53	79	2.11	1.32	10.36	62	b 2.40	b 2.80	10.3	a1.019	a .232	a 29.213
	Mar	57	2.9	a19.88	28.78	77	1.77	1.11	10.57	58	3.03	3.74	b 8.8	a1.122	a .277	29.203
	Feb	56	3.1	17.79	20.94	82	1.37	.86	10.82	78	3.36	4.31	b 9.2	a1.205	a .232	29.204
	Jan	56	2.9	17.72	15.14	80	1.09	.68	11.00	73	3.42	3.98	11.1	a1.308	a .307	a 29.274
	Dec	53	2.8	14.09	21.77	83	1.69	1.06	10.62	80	b 2.62	b 3.07	10.8	a1.258	a .281	a 29.229
Remittent Fever.																
More than Av. Pr. Ct. of Remit. Fever.	Oct	54	3.1	18.69	51.56	b 75	3.72	2.33	9.35	55	2.33	2.74	b 10.5	a .787	a .203	29.268
	Sept	53	3.3	20.87	64.72	73	5.24	3.28	8.40	42	2.28	2.42	9.0	a .967	a .103	29.210
	July	50	2.9	20.83	66.70	71	5.40	3.38	8.30	48	2.50	2.57	7.9	a .571	a .127	a 29.100
	Aug	47	3.6	21.27	66.10	73	5.52	3.45	8.23	41	2.62	2.62	7.9	a .731	a .154	29.216
	Average	44	3.3	19.01	44.72	75	3.31	2.07	9.61	57	2.75	3.11	9.3	.976	.215	29.205
Less than Av. Per Ct. of Remittent Fever.	June	43	3.3	a21.90	a67.04	b 73	a 5.59	3.49	8.19	b 40	b 2.64	b 2.70	b 6.8	.659	.116	a 29.273
	Nov	43	3.4	16.37	34.53	79	2.11	1.32	10.36	62	b 2.40	b 2.80	10.3	a1.019	a.232	a 29.213
	Apr	42	3.2	a19.22	42.00	b 67	2.42	1.51	10.17	b 52	2.90	b 3.09	10.1	a1.260	.205	29.147
	Dec	40	3.2	14.09	24.77	83	1.69	1.06	10.62	80	b 2.62	b 3.07	10.8	a1.258	a .281	a 29.229
	Feb	40	3.7	17.79	20.94	82	1.37	.86	10.82	78	3.36	4.31	b 9.2	a1.205	a .232	29.204
	May	40	3.3	a19.50	a54.38	b 70	a 3.78	2.36	9.32	b 52	2.91	3.28	9.4	.828	.177	29.131
	Mar	40	3.6	a19.88	28.78	77	1.77	1.11	10.57	58	3.03	3.74	b 8.8	a1.122	a .277	29.202
	Jan	38	3.5	17.72	15.14	80	1.09	.68	11.00	73	3.42	3.98	11.1	a1.308	a .307	a 29.274

*,†,‡,§,‖,¶,**. See foot-notes with these marks in Exhibit VIII, page 124. a Exceptions to proposition 1, relating to intermittent fever and remittent fever, on page 137. b Exceptions to proposition 2, relating to intermittent fever and remittent fever, on page 137. c As regards average temperature and absolute humidity, there is for 1884 no exception to proposition 1, relating to intermittent fever.

DIAGRAM 3.—WEEKLY REPORTS OF DISEASES IN MICHIGAN, IN 1884.



Designed by Henry B. Baker.

EXHIBIT XX.—TYPHOID FEVER AND TYPHO-MALARIAL FEVER.—*Stating, for the Year and for each Month of the Year 1884, what Per Cent of the Weekly Reports of Diseases Stated Presence of Typhoid Fever; also of Typho-Malarial Fever, and what were the Meteorological Conditions as observed at Stations in Michigan.**

Typhoid Fever.				Temperature, F.		Humidity of Air.§ Av. of 3 Daily Observations.		Vapor Inhaled and Exhaled, from Air Passages by one Person in 24 Hours. (Troy oz.)		Average Per Cent of Cloudiness.	Ozone,—Relative Scale of 10.*		Average Velocity of Wind, Miles per Hour, by Anemometer.	Atmospheric Pressure.—Inches Reduced to 32° F.		
Months in Order of Greatest Per Cent of Weekly Reports Stating Presence of.		Per Cent of Weekly Reports Stating Presence of.†	Av. Order of Prevalence where Present. †, ‡	Av. Daily Range by Registering Thermometers.	Av. of Three Daily Observations.	Relative Per Cent of Saturation.	Absolute Grains of Vapor in a Cubic Foot of Air.	Inhaled. ‖	Exhaled in Excess of that Inhaled. ¶		Day Observation, 7 A. M. to 2 P. M.	Night Observation, 9 P. M. to 7 A. M.		Range.		Average Pressure.
														Monthly and for Year.	Av. Daily by 3 Daily Observations, **	
More than Av. Per Cent of Typhoid Fever.	Nov.	23	4.1	*a*16.37	*a*34.53	*b*79	*a*2.11	1.32	10.36	*b*62	2.40	2.80	*b*10.3	1.019	.232	29.213
	Oct.	23	4.6	*a*18.69	51.56	*b*75	3.72	2.33	9.35	55	2.33	2.74	*b*10.5	*a*.787	*a*.203	29.268
	Sept.	19	5.2	20.87	64.72	73	5.24	3.28	8.40	42	2.28	2.42	9.0	*a*.967	*a*.103	29.210
	Aug.	14	6.0	21.27	66.10	73	5.52	3.45	8.23	41	2.62	2.62	7.9	*a*.731	*a*.154	29.216
	Dec.	13	4.7	*a*14.09	*a*24.77	*b*83	*a*1.69	1.06	10.62	*b*80	2.62	3.07	*b*10.8	1.258	.281	29.229
Average		12	5.2	19.01	44.72	75	3.31	2.07	9.61	57	2.75	3.11	9.3	.976	.215	29.205
Less than Average Per Cent of Typhoid Fever.	Jan.	10	5.1	17.72	15.14	80	1.09	.68	11.00	73	3.42	3.98	*b*11.1	*a*1.308	*a*.307	*a*29.274
	March	8	6.5	*a*19.88	28.78	77	1.77	1.11	10.57	58	3.03	3.74	8.8	*a*1.122	*a*.277	29.202
	July	7	5.8	*a*20.83	*a*66.70	*b*71	*a*5.40	3.38	8.30	*b*48	*b*2.50	*b*2.57	7.9	.571	.127	29.100
	Feb.	7	5.5	17.79	20.94	82	1.37	.86	10.82	78	3.36	4.31	9.2	*a*1.205	*a*.232	29.204
	April	6	5.9	*a*19.22	42.00	*b*67	2.42	1.51	10.17	*b*53	2.90	*b*3.09	*b*10.1	*a*1.260	.205	29.147
	May	5	6.4	*a*19.50	*a*54.38	*b*70	*a*3.78	2.36	9.32	*b*52	2.91	3.28	*b*9.4	.828	.177	29.131
	June	4	5.4	*a*21.90	*a*67.04	*b*73	*a*5.59	3.49	8.19	*b*40	*b*2.64	*b*2.70	6.8	.659	.116	*a*29.273
TYPHO-MAL. FEVER.																
More than Av. Per Ct. of Typho-Malarial Fever.	Oct.	39	4.1	*a*18.69	51.56	*b*75	3.72	2.33	9.35	55	2.33	2.74	*b*10.5	*a*.787	*a*.203	29.268
	Nov.	33	4.2	*a*16.37	*a*34.53	*b*79	*a*2.11	1.32	10.36	*b*62	2.40	2.80	*b*10.3	1.019	.232	29.213
	Sept.	33	4.5	20.87	64.72	73	5.24	3.28	8.40	42	2.28	2.42	9.0	*a*.967	*a*.103	29.210
	Aug.	23	5.1	21.27	66.10	73	5.52	3.45	8.23	41	2.62	2.62	7.9	*a*.731	*a*.154	29.216
	Dec.	23	4.7	*a*14.09	*a*24.77	*b*83	*a*1.69	1.06	10.62	*b*80	2.62	3.07	*b*10.8	1.258	.281	29.229
Average		20	4.6	19.01	44.72	75	3.31	2.07	9.61	57	2.75	3.11	9.3	.976	.215	29.205
Less than Av. Per Cent of Typho-Malarial Fever.	July	14	4.8	*a*20.83	*a*66.70	*b*71	*a*5.40	3.38	8.30	*b*48	*b*2.50	*b*2.57	*b*7.9	.571	.127	29.100
	Jan.	14	5.4	17.72	15.14	80	1.09	.68	11.00	73	3.42	3.98	11.1	*a*1.308	*a*.307	*a*29.274
	March	13	5.7	*a*19.88	28.78	77	1.77	1.11	10.57	58	3.03	3.74	*b*8.8	*a*1.122	*a*.277	29.202
	June	12	4.9	*a*21.90	*a*67.04	*b*73	*a*5.59	3.49	8.19	*b*40	*b*2.64	*b*2.70	*b*6.8	.659	.116	*a*29.273
	May	12	4.5	*a*19.50	*a*54.38	*b*70	*a*3.78	2.36	9.32	*b*52	2.91	3.28	9.4	.828	.177	29.131
	Feb.	12	3.9	17.79	20.94	82	1.37	.86	10.82	78	3.36	4.31	*b*9.2	*a*1.205	*a*.232	29.204
	April	11	4.1	*a*19.22	42.00	*b*67	2.42	1.51	10.17	*b*53	2.90	3.09	10.1	*a*1.260	.205	29.147

*, †, ‡, §, ‖, ¶, **. See foot-notes with these marks in Exhibit VIII, page 124.
a Exceptions to Proposition 1, relating to typhoid and typho-malarial fever, on page 137.
b Exceptions to Proposition 2, relating to typhoid and typho-malarial fever, on page 137.

EXHIBIT XXI.—MEASLES AND WHOOPING-COUGH.—*Stating for the Year and for each Month of the Year 1884 what Per Cent of the Weekly Reports of Diseases Stated Presence of Measles, also of Whooping-cough, and what were the Meteorological Conditions as Observed at Stations in Michigan.**

MEASLES.				Temperature, F.		Humidity of Air § Av. of 3 Daily Observations		Vapor Inhaled and Exhaled, from Air Passages, by one Person in 24 Hours. (Troy oz.)			Ozone,—Relative Scale of 10°.			Atmospheric Pressure. Inches. Reduced to 32° F.		
Months in Order of Greatest Per Cent of Weekly Reports Stating Presence of. *		Per Cent of Weekly Reports Stating Presence of.†	Av. Order of Prevalence where Present.†‡	Av. Daily Range by Registering Thermometers.	Av. of Three Daily Observations.	Relative Per Cent of Saturation.	Absolute Grains of Vapor in a Cubic Foot of Air.	Inhaled.‖	Exhaled in Excess of that Inhaled.¶	Av. Per Cent of Cloudiness.	Daily Observation, 7 A.M. to 2 P.M.	Night Observation, 9 P.M. to 7 A.M.	Av. Velocity of Wind,—Miles per Hour,—by Anemometer.	Range.		Average Pressure.
														Monthly, and for Year.	Av. Daily by 3 Daily Observations.**	
More than Av. Per Cent of Measles.	May	17	4.4	19.50	54.38	70	3.78	2.36	9.32	52	*b*2.91	*b*3.28	*b*9.4	*a*.828	*a*.177	*a*29.131
	Feb.	16	4.7	*a*17.79	*a*20.94	*b*82	*a*1.37	.86	10.82	*b*78	*b*3.36	*b*4.31	9.2	1.205	.232	*a*29.204
	Jan.	16	4.9	*a*17.72	*a*15.14	*b*80	*a*1.09	.68	11.00	*b*73	*b*3.42	*b*3.98	*b*11.1	1.308	.307	29.274
	April	14	3.9	19.22	*a*42.00	67	*a*2.42	1.51	10.17	53	*b*2.90	3.09	*b*10.1	1.260	*a*.205	*a*29.147
	March	14	4.9	19.88	*a*28.78	*b*77	*a*1.77	1.11	10.57	*b*58	*b*3.03	*b*3.74	8.8	1.122	.277	*a*29.202
	June	13	4.9	21.90	67.04	73	5.59	3.49	8.19	40	2.64	2.70	6.8	*a*.659	*a*.116	29.273
Average		10	5.2	19.01	44.72	75	3.31	2.07	9.61	57	2.75	3.11	9.3	.976	.215	29.205
Less than Av. Per Cent of Measles.	July	5	5.1	*a*20.83	*a*66.70	*b*71	*a*5.40	3.38	8.30	48	*b*2.50	*b*2.57	*b*7.9	.571	.127	29.100
	Sept.	4	6.7	*a*20.87	*a*64.72	*b*73	*a*5.24	3.28	8.40	42	*b*2.28	*b*2.42	*b*9.0	.967	.103	*a*29.210
	Oct.	4	7.6	18.69	*a*51.56	75	*a*3.72	2.33	9.35	55	*b*2.33	*b*2.74	10.5	.787	.203	*a*29.268
	Aug.	4	7.4	*a*21.27	*a*66.10	*b*73	*a*5.52	3.45	8.23	41	*b*2.62	*b*2.62	*b*7.9	.731	.154	*a*29.216
	Dec.	4	9.0	14.09	24.77	83	1.69	1.06	10.62	*b*80	*b*2.62	*b*3.07	10.8	*a*1.258	*a*.281	*a*29.229
	Nov.	4	9.0	16.37	34.53	79	2.11	1.32	10.36	*b*62	*b*2.40	*b*2.80	10.3	*a*1.019	*a*.232	*a*29.213
WHOOPING-COUGH.																
More than Av. Per Cent of Whooping-cough.	Aug.	29	4.3	21.27	66.10	73	5.52	3.45	8.23	41	2.62	2.62	7.9	*a*.731	*a*.154	29.216
	July	28	4.3	20.83	66.70	71	5.40	3.38	8.30	48	2.50	2.57	7.9	*a*.571	*a*.127	*a*29.100
	Average	23	4.5	19.01	44.72	75	3.31	2.07	9.61	57	2.75	3.11	9.3	.976	.215	29.205
Less than Av. Per Cent of Whooping-cough.	June	22	3.8	*a*21.90	*a*67.04	*b*73	*a*5.59	3.49	8.19	*b*40	*b*2.64	*b*2.70	*b*6.8	.659	.116	*a*29.273
	Sept.	22	5.0	*a*20.87	*a*64.72	*b*73	*a*5.24	3.28	8.40	*b*42	*b*2.28	*b*2.42	*b*9.0	.967	.103	*a*29.210
	Jan.	21	4.7	17.72	15.14	80	1.09	.68	11.00	73	3.42	3.98	11.1	*a*1.308	*a*.307	*a*29.274
	Feb.	21	4.6	17.79	20.94	82	1.37	.86	10.82	78	3.36	4.31	*b*9.2	*a*1.205	*a*.232	29.204
	May	21	4.3	*a*19.50	*a*54.38	*b*70	*a*3.78	2.36	9.32	*b*52	2.91	3.28	9.4	.828	.177	29.131
	March	20	5.1	*a*19.88	28.78	77	1.77	1.11	10.57	58	3.03	3.74	*b*8.8	*a*1.122	*a*.277	29.202
	Dec.	17	4.1	14.09	24.77	83	1.69	1.06	10.62	80	*b*2.62	*b*3.07	10.8	*a*1.258	*a*.281	*a*29.229
	April	16	5.1	*a*19.22	42.00	*b*67	2.42	1.51	10.17	*b*53	*b*2.90	*b*3.09	10.1	*a*1.260	.205	29.147
	Oct.	15	5.1	18.69	*a*51.56	75	*a*3.72	2.33	9.35	*b*55	*b*2.33	*b*2.74	10.5	.787	.203	*a*29.268
	Nov.	14	4.3	16.37	34.53	79	2.11	1.32	10.36	62	*b*2.40	*b*2.80	10.3	*a*1.019	*a*.232	*a*29.213

*, †, ‡, §, ‖, ¶, **. See foot-notes with these marks in Exhibit VIII, page 124.

a An exception to Proposition 1, relating to Measles and Whooping-cough, on page 137.

b An exception to Proposition 2, relating to Measles and Whooping-cough, on page 137.

EXHIBIT XXII.—*Summary Relative to Propositions contained in Exhibits VIII, X, XII, XIII, XIV, XV, etc., (pages 124–134) concerning Relations, by Months in 1884, between Greater or Less than usual Prevalence of Diseases named, and certain given coincident Climatic Conditions.*

Diseases.	Months (inclusive) in which Diseases named were More than Usually Prevalent in 1884.	Months (inclusive) in which Diseases named were More than Usually Prevalent in 1884.	For the 12 Months of the Year 1884, Number of Months in which Propositions Hold True.*										
			That in Months when Diseas's nam'd were more than Usually Prevalent the Conditions named below were Greater than Usual, and in Months when less than Usually Prevalent these Conditions were Less than Usual.									That in Months when Diseases named were more than Usually Prevalent the Conditions named below were Lower than Usual, and in Mos. when the Diseases were Less than Usually prevalent these Conditions were Higher than Usual.	
						Ozone.			Atmospheric Pressure.				
									Range.				
			For Av. Daily Range of Temp.	Relative Humidity.	Av. Per Cent of Cloudiness.	Day.	Night.	Velocity of Wind.	Monthly.	Average Daily.	Average Daily.	Average Temperature.	Absolute Humidity.
Bronchitis	Jan. to April, Nov., Dec.	May to October	3	10	11	9	8	8	12	11	5	12	12
Pneumonia	Jan. to April, Dec.	May to Nov.	4	9	10	10	9	7	11	10	4	11	11
Membranous Croup	Jan., Feb., Oct. to Dec.	March to Sept.	0	11	10	6	7	9	9	10	8	9	9
Diphtheria	Jan., Mch., May Oct. to Dec.	Feb. Apr., June to Sept.	3	10	9	7	9	10	8	9	7	8	8
Tonsilitis	Jan. to May, Nov., Dec.	June to Oct.	4	9	10	10	9	9	11	10	3	11	11
Influenza	Jan. to May, Aug., Dec.	June, July, Sept. to Nov.	6	7	8	10	9	7	9	8	4	9	9
Scarlet fever	Jan. to May	June to Dec.	6	7	8	12	11	7	9	8	2	9	9
Rheumatism	April to June, Nov., Dec.	Jan. to March, Aug. to Oct.	6	5	6	6	5	9	6	6	6	7	7
Neuralgia	Feb. to May, Nov., Dec.	Jan., June to Oct.	5	8	9	9	8	8	10	9	9	10	10
Consump. Pul.	March to October	Jan., Feb., Nov., Dec.	11	2	1	5	4	4	2	1	5	2	2

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* The figures in each of these eleven columns show for how many months, out of the twelve months in the year 1884 the proposition named holds true; thus for Bronchitis, the proposition was true for only three months, so far as relates to average daily range of temperature; while the proposition relative to average temperature and absolute humidity holds true for all the 12 months of the year.

In Exhibits XXII and XXIII, large numbers opposite any given disease indicate that the disease has close relations to the climatic conditions under which the large numbers stand; thus bronchitis, pneumonia, tonsilitis, and intermittent fever are much influenced if not controlled by certain meteorological conditions, the influence of which can undoubtedly eventually be learned.

EXHIBIT XXIII.—*Summary Relative to Propositions contained in Exhibits XVII. XIX., XX., XXI. (pages 138, 141, 143 and 144), concerning Relations, by Months in 1884, between Greater or Less than Usual Prevalence of Diseases named, and certain given coincident Climatic Conditions.*

Diseases.	Months (Inclusive) in which Diseases named were more than Usually Prevalent in 1884.	Months (inclusive) in which Diseases named were more than Usually Prevalent in 1884.	For the 12 Months of the Year, 1884, Number of Months in which Propositions hold True.*										
			That in Months when Diseases named were more Prevalent than usual the conditions named below were Higher than Usual, and in Months when the Diseases were Less Prevalent than Usual these Conditions were Lower than Usual.						That in Months when Diseases named were More Prevalent than Usual the conditions named below were Less than Usual, and in Months in which the Diseases were Less Prevalent than Usual these conditions were Greater than usual.				
						Atmospheric Pressure.					Ozone.		
						Range.							
			Av. Daily Range of Temp.	Av. Temperature.	Absolute Humidity.	Monthly.	Av. Daily.	Av. Daily.	Relative Humidity.	Av. Per Cent. of Cloudiness.	Day.	Night.	Velocity of Wind.
Diarrhea	June to Oct	Jan. to May, Nov, Dec	8	11	11	1	2	8	9	10	10	10	9
Cholera Inf'm	July to Oct	Jan. to June, Nov., Dec	7	10	10	2	3	3	8	9	9	8	8
Int. Fever	May to Oct	Jan. to April, Nov., Dec	9	12	12	0	1	7	10	11	9	8	8
Remit't Fever	July to Oct	Jan. to June, Nov., Dec	8	10	10	2	3	7	9	9	9	8	8
Typhoid Fever	Aug. to Dec	Jan. to July	2	7	7	5	6	10	5	6	10	9	6
Typh-mal. Fever	Aug. to Dec	Jan. to July	5	7	7	5	6	10	5	6	10	10	5
Measles	Jan. to June	July to Dec	7	4	4	8	7	3	5	7	1	2	6
Whoop-cough	July, Aug	Jan. to June, Sept. to Dec	7	8	8	4	5	5	7	7	6	6	7

*The figures in each of these eleven columns show for how many months out of the twelve months in 1884, the proposition over the column holds true; thus, concerning diarrhea, the proposition relative to Average Daily Range of Temperature held true in eight months out of the twelve; that relative to Average Temperature, eleven months out of twelve, etc.

TOTAL SICKNESS—AVERAGE DISEASE.

"Average disease" is an average of the tabulated diseases reported present on all the cards received and compiled at this office during the year. It is probably equivalent to the actual sickness from all diseases printed on the report cards, and probably represents very nearly the average sickness from all the diseases in the State. A sample of the report cards on which diseases are reported to this office is found on page 90. Twenty-seven diseases are printed on the cards. In 1884 there were 3,957 of these card reports received. On some of the cards only one or two diseases were reported present; on others twenty or more were reported. Had each disease (printed on this card, and only those twenty-seven diseases thus named) been reported present on every card received at this office there would have been 106,839 reports of diseases present. (This is the product of the 3,957 reports received, multiplied by 27, the number of diseases printed on the cards, or 100 per cent of the possible disease-reports.) There were actually present on the cards received at this office only 31,466 disease-reports, which is 31,466 ÷ 106,839 of the possible disease-reports that might have been present, or 29 per cent. This 29 per cent represents the actual sickness in the State, or in other words, the sickness from "average disease."

What we term "average disease" is for the State the same as the per cent which the sickness actually reported by all observers is of the sickness which might have been reported on the 3,957 report cards received.

Exhibit XXIV serves to indicate the probable actual sickness in the State by months in each year from 1877 to 1884. It compares the sickness in 1884 by months with the sickness in each of the eight years 1877–1884. It also affords data for the comparison of the sickness in each month in each year from 1877 to 1884, with the sickness of 1884.

It will be seen by this exhibit that the sickness in 1884 was less than the average for the eight years, both for the year and for the months from January to May inclusive, and November and December. It was slightly more than the average in June, July, August and October, and equal to the average in September.

By comparing this exhibit with Exhibit VII it will be seen that in all the months in which the sickness was less than the average for the eight years the average temperature was lower, the average daily range of temperature was greater, and the average absolute humidity was less than the average for the eight years 1877 to 1884.

EXHIBIT XXIV.—Sickness from Average Disease, 1877–84.—*By Year and Months for each of the Eight Years 1877–84, Stating on an Average for such of the 27 diseases tabulated as were reported present, what per cent of the Weekly Reports received stated presence of the Diseases, and comparing the Average Per Cents for Months in 1884 with the Averages for corresponding Months in those Years.*

Years, etc.	Annual Av.	Jan.	Feb.	Mar.	April.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
Average 8 Years 1877-84	31	31	31	31	31	29	28	30	33	34	32	31	30
1877	28	27	28	26	24	24	23	26	29	31	30	30	30
1878	30	30	30	31	29	28	26	28	32	35	34	30	32
1879	33	35	36	36	35	30	30	32	37	36	34	34	33
1880	32	32	32	32	31	30	31	34	36	35	32	30	31
1881	33	34	34	32	35	31	30	34	37	36	35	32	31
1882	30	31	30	30	30	29	28	28	30	34	32	31	29
1883	30	30	31	33	33	31	29	29	32	32	29	29	28
1884 (Diagram, page 135)*	29	29	29	30	28	28	29	31	34	34	33	30	29
In 1884 **Greater** than Av. 1877-84	.....	....	....	....	....	....	1	1	1	=	1	....	....
In 1884 **Less** than Av. 1877-84	2	2	2	1	3	1	....	....	....	....	....	1	1

* Twenty-seven diseases are tabulated for 1884.

RELATIONS OF TOTAL AMOUNT OF SICKNESS TO METEOROLOGICAL CONDITIONS.

Proposition 1.—That in months when **more** than the average per cent of weekly reports stated the presence of such of the 27 diseases tabulated (in tables on pages 97–114) as were reported present, the average daily range of temperature, the average daily temperature, the absolute humidity of the atmosphere, the monthly and the average daily range of the barometer, and the average daily pressure of the atmosphere, were **greater** than the average for the year; and in months when **less** than the average per cent of reports stated the presence of said diseases those conditions were **less** than the average for the year. In Exhibit XXV, below, the letter *a* marks exceptions to this proposition for the year 1884.

PROPOSITION 2.—That in months when **more** than the average per cent of weekly reports stated the presence of such of the 27 diseases tabulated as were reported present, the relative humidity of the atmosphere, the average per cent of cloudiness, the ozone, and the average velocity of the wind were **less** than the average for the year; and in months when **less** than the average per cent of reports stated the presence of said diseases those conditions were **greater** than the average for the year. In Exhibit XXV, below, the letter *b* marks exceptions to this proposition for the year 1884.

What per cent of the weekly reports received in 1884 (on an average for such of the tabulated diseases as were reported present) stated presence of the diseases, is graphically represented by months in Diagram 5, page 135.

EXHIBIT XXV.—AVERAGE DISEASE.—*Stating for the Year and each Month of the, Year 1884, what Per Cent of the weekly reports of Diseases on an Average for such of the 27 Tabulated Diseases as were reported present, Stated Presence of the Diseases, and what were the Meteorological Conditions as observed at Stations in Michigan.**

AVERAGE DISEASE.				Temperature, F.		Humidity of Air.§ Av. of 3 Daily Observations.		Vapor Inhaled and Exhaled, from Air Passages, by one Person in 24 Hours. Troy Ounces.			Ozone—Relative Scale of 10°.			Atmospheric Pressure, Inches Reduced to 32° F.		
														Range.		
	Months in order of Greatest Per Cent of Weekly Reports Stating Presence of.	Per Cent. of Weekly Reports Stating Presence of.+	Av. Order of Prevalence where Present.+,‡.	Average Daily Range, by Registering Thermometers.	Average of 3 Daily Observations.	Relative Per Cent of Saturation.*	Absolute—Grains of Vapor in a Cubic Foot of Air.	Inhaled.‖	Exhaled in Excess of that Inhaled.¶	Average Per Cent of Cloudiness.	Day Observation, 7 A. M. to 2 P. M.	Night Observation, 9 P. M. to 7 A. M.	Average Velocity of Wind, Miles per Hour, by Anemometer.	Monthly, and for Year.	Average Daily, by 3 Daily Observations.**	Average Pressure.
More than Av. Per Cent.	September	34	4.4	20.87	64.72	73	5.24	3.28	8.40	42	2.28	2.42	9.0	*a* .967	*a* .103	29.210
	August	34	4.4	21.27	66.10	73	5.52	3.45	8.23	41	2.62	2.62	7.9	*a* .731	*a* .154	29.216
	October	33	4.2	*a*18.69	51.56	75	3.72	2.33	9.35	55	2.33	2.74	*b* 10.5	*a* .787	*a* .203	29.268
	November	30	4.2	*a*16.37	*a*34.53	*b* 79	*a* 2.11	1.32	10.36	*b* 62	2.40	2.80	*b* 10.3	1.019	.232	29.213
	March	30	4.3	19.88	*a*28.78	*b* 77	*a* 1.77	1.11	10.57	*b* 58	*b* 3.03	*b* 3.74	8.8	1.122	.277	*a* 29.202
	July	30	4.0	20.83	66.70	71	5.40	3.38	8.30	48	2.50	2.57	7.9	*a* .571	*a* .127	*a* 29.100
Average		29	4.2	19.01	44.72	75	3.31	2.07	9.61	57	2.75	3.11	9.3	.976	.215	29.205
Less than Av. Per Cent.	February	29	4.2	17.79	20.94	82	1.37	.86	10.82	78	3.36	4.31	*b* 9.2	*a*1.205	*a* .232	29.204
	December	29	4.1	14.09	24.77	83	1.69	1.06	10.62	80	*b* 2.62	*b* 3.07	10.8	*a*1.258	*a* .281	*a* 29.229
	June	29	4.0	*a*21.90	*a*67.04	*b* 73	*a* 5.59	3.49	8,19	*b* 40	*b* 2.64	*b* 2.70	*b* 6.8	.659	.116	*a* 29.273
	January	29	4.1	17.72	15.14	80	1.09	.68	11.00	73	3.42	3.98	11.1	*a*1.308	*a* .307	*a* 29.274
	April	28	3.9	*a*19.22	42.00	*b* 67	2.42	1.51	10.17	*b* 53	2.90	*b* 3.09	10.1	*a*1.260	.205	29.147
	May	28	4.1	*a*19.50	*a*54.38	*b* 70	*a* 3.78	2.36	9.32	*b* 52	2.91	3.28	9.4	.828	.177	29.131

*, †, ‡, ‖, §, ¶, ** See foot-notes with these marks in Exhibit VIII, page 124. It should be noticed that small numbers in the "Av. Order of Prevalence" column in this exhibit indicate less rather than more sickness—reversing the rule stated in note *e*, on page 117, with reference to a single disease, or when one disease is compared with another.

a Exceptions to Proposition 1, on page 147.

b Exceptions to Proposition 2, on page 148.

DISEASES REPORTED ON THE CARDS IN ADDITION TO THOSE TABULATED IN THIS REPORT, REMARKS RELATIVE TO HEALTH OR SICKNESS, ETC.

The names of twenty-seven diseases are printed on the report-cards. Near the bottom of the cards are one or two blank lines on which other diseases may be reported, or remarks inserted in regard to marked increase or decrease of any disease. "If any disease not printed on the card has a greater number of cases, and is, therefore, higher in the 'order of prevalence,' than some other disease printed on the card, it should be written on the card with its proper number opposite; as should, also, any other important disease." It is desirable that diseases that become suddenly prevalent or that suddenly disappear, or such diseases as result in an unusual death rate or seem to be influenced by peculiar atmospheric conditions, shall be noticed by the observers, and remarks inserted in the blank spaces provided for that purpose. During the year 1884, parotitis was reported on one hundred and twenty cards, in thirty-two localities, dyspepsia was reported on fifty-four cards, chicken-pox on forty, pleuritis on twenty-six, asthma on twenty, ascites on seventeen, peritonitis on thirteen, chorea on nine, diabetes on seven, cancer and German measles on six, pharyngitis on five, apoplexy on four, epilepsy, paralysis, cytisis and gonorrhea on three, eczema on two, and purpurea on one card.

Besides the above reports for the year there was reported in *January* enteric consumption at Maple Rapids, trichiniasis at Niles, urticaria and erythema at Kalamazoo, pericarditis at Memphis; in *February* jaundice at Grand Rapids, itch at Hesperia, gastritis at North Muskegon, epidemic of measles and winter cholera at Saginaw City, itch, quinsy, and one death from trichiniasis at Niles, heart disease at Jackson prison, roseola at Kalamazoo, increase of sickness at Detroit, gastritis at Memphis, the patient dying from taking kerosene oil, an unusual number of deaths at Monroe; in *March*, very little sickness at Whitehall, very little sickness at Hastings, abscess of liver at Albion, a great deal of sickness at Jerome, but not of a class that is mentioned on the cards, hysteria and pyelitis at Quincy, not much sickness at Detroit, puerperal fever seeming to be endemic in part of Monroe county; in *April*, dropsy of brain at Columbiaville, much less sickness at Port Huron, also death rate from diphtheria epidemic about 20 per cent, from scarlatina, 16 per cent, scirrus of breast at Quincy, heart disease, gastric ulcer, mastitis and hemiplegia at Armada, some increase of sickness at Detroit, alarmingly healthy at Pontiac, pericarditis at Memphis; in *May*, a case of patency at Hastings, dropsy of brain at Columbiaville, irritable bladder at Ithaca, dull for doctors at Kalamazoo, heart disease, hemiplegia, hæmaturea and gastric ulcer at Armada, not much sickness at Detroit, very healthy at Northville; during *June*, death from heart disease and one from exhaustion at Cadillac, otorrhea at Lake township, gastritis and laryngitis at East Tawas, the village of Hersey entirely free from the diseases mentioned on the cards, not a case of sickness in Clare, very little sickness in Port Huron, less sickness than usual at Corunna, heart disease at Middleville, twenty-four persons poisoned by cheese, very little sickness at Kalamazoo, gastric ulcer and Bright's disease at Armada, very little sickness at Detroit, no sickness worthy of note at Northville, roseola at Wyandotte; during *July*, locomotor ataxy at Mackinac, very healthy and fits at Cadillac, aortic stenossis at Sand Lake, not a case of sickness at Clare, gastritis at Columbiaville, typhoid pneumonia at East Saginaw, marasmus and tabes mesenterica at

Sheridan, a case of typhoid fever at Kalamazoo, was an emigrant who had typhoid fever before coming over, was taken with dysentery which being checked the typhoid showed itself again, the patient dying two days after the attack, many bilious attacks at Ypsilanti, heart disease and gastric ulcer at Armada, some increase of sickness among children, bowel diseases becoming rather prevalent and fatal at Detroit, very healthy at Holly, sun stroke at Wyandotte; during *August*, one death from entero-colitis at Clare, gastritis at Columbiaville, very little sickness at South Bay City, syphilis at Middleville, tabes mesenterica at Sheridan, heart disease, gastric ulcer, mastitis, gastritis, bowel diseases prevalent at Detroit; during *September*, typhoid fever brought from Louisiana at Alpena, rate of mortality very low at Ludington, gastritis at Big Rapids, gastritis at Columbiaville, ophthalmia at Portland, tabes mesenterica at Sheridan, scarlet fever epidemic mild and irregular at Dowagiac, dysentery of a severe type prevailing at Niles, hemorrhage of stomach at Saugatuck, pyæmia at Burr Oak, heart disease and gastric ulcer at Armada, not much sickness and death rate high at Detroit; during *October*—herpetic pharyngitis and convulsions at Ishpeming, laryngitis at East Tawas, epidemic of tonsilitis, dysentery in camps very severe at Meredith, herpes zoster affecting arm and one case thrombosis at South Bay City, congestion of brain and spine at Fowlerville, ophthalmia at Hubbardston, tabes mesenterica at Sheridan, not much sickness at Detroit; during *November*—angina pectoris at Lake township, angina pectoris at Meredith, very healthy at Columbiaville, pericarditis at Ithaca, very healthy at Niles, not much sickness at Detroit, bronchitis prevails among children at Northville; during *December*—ulcerated sore throat at Houghton, laryngitis at East Tawas, very little sickness at South Bay City, diphtheria increasing—school closed at Meredith, pericarditis at Ithaca, no sickness, village very healthy at Sheridan, itch and mild scarlet fever at Niles, diphtheritic paralysis, some sudden deaths, not much sickness at Detroit, heart disease and perityphlitis at Memphis.

MONTHLY BULLETINS.—HEALTH IN MICHIGAN.

In August 1884, a series of monthly bulletins of health in Michigan was begun. The one for August 1885 is printed in the first part of this Report. These bulletins are similar to the weekly bulletin of "Health in Michigan," and they are sent as soon as possible after the close of each month to the sanitary exchanges of this Board. Each bulletin states the prevalence of each of the 27 diseases, the names of which are printed on the postal-card blanks; the diseases are arranged in order of the number of reports of each, the disease reported by the largest number of observers first. Each bulletin states also the marked increase or decrease of any disease in each month as compared with the preceding month, and as compared with the average of the corresponding month of the years since and including 1879. It also states the temperature, humidity and ozone at a central station as compared with the years since and including 1879, stating whether these conditions are higher, lower, or the same as the average for each month.

These monthly bulletins are made up from the bulletins of "Health in Michigan." The weekly bulletins are made up from the cards that are received before Wednesday morning of each week stating the presence of diseases for the week ending on the preceding Saturday. As a rule about one-half of the cards reach this office in time to be compiled in the weekly bulletin. The remaining cards are received too late to be compiled for the weekly bulletin but in time to be used in the annual report.

By careful comparison it is found that the statements made in the monthly bulletins, so far as issued, are corroborated by the facts brought out in the compilation of the whole number of reports for the corresponding months of the year. This is gratifying because it shows that the facts brought out by about one-half of the observers are substantially the same as the facts brought out in the compilation of the reports by the whole number of observers; this serves to reinforce the belief that a sufficient number of weekly reports are received to supply nearly or quite true average statements of the sickness which occurs throughout the State.

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CONFERENCES OF REPRESENTATIVES OF STATE BOARDS OF HEALTH.

REPORT BY THE SECRETARY OF THE STATE BOARD OF HEALTH.

To the President and Members of the Michigan State Board of Health:

GENTLEMEN:—May 7, 1884, a Conference of executive officers and other representatives of the State Boards of Health was held in Washington, D. C. As delegate from this Board I attended that meeting, and a report of it is printed on pages 16–18 of the report of this Board for 1884. The general purposes of the conference are stated in that report.

October 13–15, 1884, the Conference met again in St. Louis, Mo. The subjects which most engaged the attention of those present were the threatened introduction of cholera into this country, and the best methods for the prevention of its introduction, and of its spread in case of its introduction. Thirty-seven delegates from nineteen State Boards of Health were present, and also delegates from the Provincial Board of Health of Ontario, and from the Dominion of Canada, and from prominent municipal Boards of Health in the United States. Hon. Erastus Brooks, of New York, was president of the Conference, and J. N. McCormack, M. D., of Kentucky, was secretary.

A paper was read by John H. Rauch, M. D., Secretary of the Illinois State Board of Health, on "Practical Recommendations for the Exclusion and Prevention of Asiatic Cholera."

Charles Smart, M. D., surgeon U. S. army, read a paper entitled "Quarantine and Sanitary Methods Formulated by the National Board of Health in *Re* Asiatic Cholera." The paper covered points as follows:

1. International coöperation.
2. Measures to be adopted at foreign ports.
3. Sanitary service at sea.
4. Methods recommended to be adopted on the arrival of the vessel at a U. S. port.
5. Sanitary supervision of travel and transportation, coastwise and inland.

Reference was made to another important series of measures, published in detail in the first issue of the *Bulletin of the National Board of Health*, June 28, 1879:

1. Efforts to prevent the spread of the disease, by securing sanitary condition of localities.

2. Efforts to suppress an epidemic, (*a*) by house-to-house visitation for instruction, disinfection, etc.; (*b*) establishment of camps, and removal from infected localities; (*c*) the extemporization of small hospitals, near infected localities, ambulances, and systems of disinfection.

It was voted that all papers read be referred to a special committee of five for consideration, and to formulate a report based thereon, embodying the methods which should be approved by the Conference for combating cholera. The chairman, Hon. Erastus Brooks, of New York, appointed as such committee Drs. Baker (Mich.), Rauch (Ill.), Walcott (Mass.), Herrick (La.), and Bryce (Ontario).

October 14 a paper was read by C. W. Chancellor, M. D., secretary of the Maryland State Board of Health. It was entitled, "Can Epidemic Diseases be Excluded by Sanitary Cordons?" It related chiefly to Asiatic cholera. This paper was discussed at considerable length.

The committee appointed to consider the papers presented and to formulate a report on methods for the prevention of cholera in America, presented the following report on

PRACTICAL WORK REQUIRED FOR THE PREVENTION OF CHOLERA IN THIS COUNTRY.

To the Conference of State Boards of Health:

MR. PRESIDENT AND MEMBERS:—Your committee, to whom was referred papers relating to the practical work required for the prevention of epidemic cholera in this country, respectfully report as follows:

ORIGIN AND DISSEMINATION.

There are three factors essential to the prevalence of cholera in this country as an epidemic: (1) The importation of the disease by means of ships, more or less directly from its only place of origin in India; (2) local unsanitary conditions favorable to the reception and development of the disease; (3) persons sick with the disease in some of its stages, or things infected by such sick persons, to carry it from place to place. These three factors naturally suggest the methods of combating the disease, for which there is needed practical work, international, national and inter-State, State, and local. So far as relates to State and local boards of health, their organization and activities are greater than ever before; but it must be admitted that after cholera has been introduced into a country, inland quarantines are not easily and successfully maintained, although efforts in this direction are then advisable. In view of the threatened introduction of cholera into this country during the coming year, and the immense waste of life and property values which would thence result through derangements of commerce, trade and productive industries, it is the sense of this Conference that the general government should maintain such a National health service as shall, by rigid inspection at the port of embarkation, ascertain the condition, as to disease and infection, of all persons and things from infected districts, and secure the surveillance of such persons and things while on shipboard, and, when necessary, their detention at quarantine stations on this side for treatment and disinfection.

OFFICIAL INSPECTION AT FOREIGN PORTS.

In view of the present threatening aspect of Asiatic cholera, and the constant danger from other communicable diseases occurring at foreign ports having commercial relations with the United States, we urge upon Congress to provide for the appointment and maintenance of medical officers of health, at all foreign ports where cholera, yellow fever, plague, small-pox or other epidemic contagious or infectious disease exists or is liable to exist, such officers being either accredited consuls or attached to the consulates. The duties of these officers shall be: To give notice, by telegraph when practicable, of the existence or appearance of any of the above-named diseases to some constituted authority in this country; to give notice of the departure of any vessel known or suspected to be infected, for any port in the United States; and, whenever requested by the master of any vessel about to load or leave for this country, to inspect thoroughly such vessel in all her parts, and also her cargo, her crew and passengers; to use such cleansing and disinfection as he may deem necessary, and to satisfy himself that all persons about to sail are free from dangerous communicable diseases, are not recently from infected places, and are properly protected from small-pox, giving to her commander a certificate of the inspection and of all precautionary measures taken. And it shall be the duty of the central authority in this country promptly to transmit intelligence of the existence of the above-mentioned diseases at foreign ports and places, and of the departure of dangerous vessels for the United States and Canada, to all State and local health authorities in the country which may be interested in the same. We further recommend, in case of those foreign ports which have no consular agents of this country, or no telegraphic communication with this country, and which are liable to transmit pestilence through commercial intercourse, that one or more medical officers be chosen to visit such ports as often as may be deemed necessary by the central health authority in this country, so as to give trustworthy information of the health and sanitary condition of those places.

CANADIAN HEALTH WORK.

Inasmuch as the Dominion of Canada is equally interested with the United States in protecting itself and the United States from the importation of dangerous diseases, we suggest that Congress take such measures as will bring about concerted action with the Dominion and the British government, by which the consuls of this country or of England at foreign ports shall examine and take such action as they may deem effective, and notify the authorities of such government as has authority over any port to which any ship may sail in the United States or Canada, in order that such government may be in a position to take effective measures against the importation of these diseases. We are gratified that the authorities of the Dominion of Canada and of the Province of Ontario have taken active steps toward protecting the people of Canada, and, indirectly, those of the United States, by the adoption of judicious quarantine regulations. We feel, however, that with respect to those regulations regarding the landing of passengers from the mail steamers along the St. Lawrence, etc., further special regulations for the thorough disinfection of the baggage and effects of all passengers, cabin or steerage, who come from infected ports or places, should be carried out in a manner similar to that recommended by the National Board of Health. Believing that the importation of cholera into this country has usually attended the arrival of immigrants from infected countries, we therefore recommend that all such immigrants be prevented from landing at our ports until such time as the danger of the introduction of cholera by them shall have passed.

NATIONAL HEALTH WORK.

The inspection and quarantine service inaugurated by the National Board of Health, and set forth in the paper by Dr. Smart before this Conference, but which system is now inoperative for want of an appropriation by Congress, meets with our cordial approval. To enable these protective measures to be carried out, we recommend that Congress be urged in the strongest terms to legislate on this subject at an early date in its coming session, and to appropriate such funds as may be needful. The expenses incident to the work which has to be performed at foreign ports, and the establishment of refuge stations at points on our coast for the detention and treatment of infected vessels arriving from foreign ports, should undoubtedly be borne by the National government, and not by individual States or municipalities; for the benefits accruing therefrom are general and not restricted to localities, although some ports and cities on the coast may have a more immediate interest in the matter than others in the interior. It is probable, however, that this National protective work may not be sufficient. It will, undoubtedly, delay and lessen the chances of invasion, but it may not suffice to prevent invasion; the poison of the disease is subtle, and may effect an entrance into the country at some unguarded point. The funds necessary for stamping out the disease in a particular locality, and for preventing its spread to other localities, might in some instances be borne by the municipality or State affected; but should the disease occur in a locality which has failed or is unable to make provision for the occurrence, its spread to other cities and States would be imminent. The want of means at the infected point would be disastrous to many others. Congress has recognized the necessity for aid to State and local boards of health under similar conditions in the case of yellow fever. In 1879 the sum of $500,000 was appropriated, and placed at the disposal of the National Board of Health; and the records show that of this sum $160,000 was wisely and successfully employed in combating the epidemic of that year. We therefore recommend that the influence of this Conference be used with the view of having appropriated by the National Legislature the sum of $500,000, to be used, or as much thereof as may be needful, in case of a cholera invasion, in stamping out the disease from the infected localities and in preventing its spread from State to State.

STATE AND LOCAL HEALTH WORK.

The removal of local unsanitary conditions favorable to the development of cholera is the special work of State and local boards of health. Much has been done already in some States, but much remains which should receive immediate attention. Where it can be done, State sanitary inspectors should be appointed to visit all towns and cities especially liable to the disease, to counsel with the local authorities as to the best methods of prevention. This work should be vigorously prosecuted before the disease reaches our shores. Health officers and inspectors appointed by State or Provincial boards of health should, in addition to other sanitary work, see that the localities have set apart, erected or planned to be set apart or erected, structures which shall possess the sanitary requirements of an isolation hospital. But as regards all necessary work by local boards of health, most State and Provincial boards of health have already printed and issued documents which give ample instruction.

The cause of cholera is contained in the discharges from persons affected by the disease, or in things infected by such discharges. Should the disease reach our shores, the first case, and after this the first case which reaches any given community, should be strictly isolated; all infective material from these and from any subsequent cases should be destroyed in such manner as to stamp out the disease. Intelligent sanitary precautions beforehand and scientific disinfection and treatment in the presence of the disease, should take the place of the inevitable cruelties of a panic. In case any city or town is infected, the same principles of isolation should in general be applied to the city as to the infected individual. Intercourse with other cities and places should be under sanitary supervision, substantially as set forth in the rules and regulations of the National Board of Health, respecting the inspection of travelers, disinfection of effects, vehicles, etc.

MEETING IN WASHINGTON PROPOSED.

Your committee recommends that when this Conference adjourns it be to meet in Washington, D. C., the second Wednesday in December next; and that the Secretary of this Conference be directed to invite the attendance at that time of the quarantine officers and the health officers of the principal cities in the United States and Canada, and that each delegate to that meeting be prepared to report the sanitary status of his State or locality and what steps have been taken to improve the same, and to prevent the introduction of disease.

All of which is respectfully submitted.

HENRY B. BAKER,
Secretary State Board of Health of Michigan.
H. P. WALCOTT,
Chairman Health Department of Massachusetts.
S. S. HERRICK,
Secretary State Board of Health of Louisiana.
PETER H. BRYCE,
Secretary Provincial Board of Health, Ont., Canada.
JOHN H. RAUCH,
Secretary State Board of Health of Illinois.
Committee.

Adopted by the Conference of State Boards of Health at St. Louis, Mo., October 14, 1884.

ERASTUS BROOKS,
President of the Conference of the State Boards of Health.
J. N. McCORMACK,
Secretary of the Conference of State Boards of Health.

Adopted by the American Public Health Association at St. Louis, Mo., October 15, 1884.

ALBERT L. GIHON,
President American Public Health Association.
IRVING A. WATSON,
Secretary American Public Health Association.

The report of the committee was discussed at length. On a formal ballot all the States voted for the approval of the report, except Minnesota; representatives of that State suggested that the subject was so important that more time should be taken for its consideration.

October 15 the report was presented by the officers of the Conference to the American Public Health Association. It was there discussed, and, on motion, it was voted that it be endorsed by the Association, printed, and copies be sent to the President of the United States and members of his Cabinet, to Senators and Representatives in Congress, to the health officers of cities, to the secretaries of State Boards of Health, and to the officers of the Dominion of Canada, and to the Provincial Board of Ontario.

In accordance with the resolution offered by the committee, the Conference of State Boards of Health adjourned to meet in Washington, December 10, 1884.

THE MEETING IN WASHINGTON, D. C., DECEMBER 10, 1884.—CONFERENCE OF STATE BOARDS OF HEALTH, AND BY INVITATION OTHER HEALTH OFFICERS IN THE UNITED STATES AND CANADA.

The plan for this meeting, adopted by the Conference at the St. Louis meeting, was "That each delegate be prepared to report the sanitary status of his State or locality, and what steps have been taken to improve the same, and to prevent the introduction of disease." Accordingly each delegate was allowed five minutes' time in which to speak for his State or locality. The roll of States was called in alphabetical order. Such reports as I am able to give are as follows:

CONNECTICUT.—"Early in the year the State Board caused to be issued a circular relating to the expected invasion of cholera, and giving instructions to the local boards as to the best means of protecting the public from it, or limiting the spread of it, if it should reach us. Later a more urgent appeal has been sent to every town, pressing upon those who are responsible for the public health, the duty of having their health boards immediately organized for active work. * * * I believe I am justified in reporting that during the present winter such effort will be made throughout the State in removing the unsanitary conditions which may now exist as will put us in a fairly good condition to meet the enemy. And if we do not succeed in wholly excluding it from our borders, our people will at least be so well instructed as to control it and limit its destructive power to the minimum. * * * The threatened invasion of cholera has had a salutary effect upon the public mind everywhere with us. The people are more ready than ever before to give heed to those precautions which are necessary to their safety. I believe if the dreaded pestilence comes, it will not find us altogether unprepared."—C. A. LINDSLEY, M. D., Secretary State Board of Health.

GEORGIA.—"The quarantine station of this port (Savannah) is twelve miles distant in an air line from the city, with buildings and wharfage erected on an oyster reef or island. The quarantine regulations are very stringent, having been enacted with special view to the prevention of the introduction of yellow fever, and are rigidly enforced." * * * The natural advantages of Savannah are good, and "the sanitary policing of the city is excellent, the streets and lanes being kept clean at all times. * * * The municipal authorities have taken no special steps with reference to the expected visitation to the United States of cholera, but will continue to demand the most rigid compliance with all ordinances promoting cleanliness of the city and surroundings; and of quarantine regulations, especially that of thorough disinfection and cleansing of vessels, cargoes, and the clothing, bedding, etc., of crews or passengers from infected or suspected ports."—J. T. MCFARLAND, M. D., Health Officer, Savannah.

ILLINOIS.—"This Board has given the subject under discussion its serious attention for some time. The published proceedings of the Board show that as early as March, 1883, the probable spread of cholera was then under consideration, and during the spring and summer of that year, with such contingency in view, the condition of the Chicago river and the Illinois and Michigan canal, with reference to the Chicago water-supply, and the disposal of the Chicago sewage as affecting the cities and towns along the line of the canal, were made the subjects of a report to the Governor of the State, and of communications to the Mayor and Health Commissioner of Chicago. In response to circulars issued July 3, reports have already been received from some 420 cities, towns and villages, setting forth their sanitary conditions, detailing the recent efforts made to improve them, and furnishing copies of existing health laws and ordinances for suggestions as to their amendment. As soon as the weather will permit, a systematic sanitary survey will be begun in the southern portion and carried northward with the advancing season; so that by the first of May the sanitary condition of every dwelling in all its belongings, of all premises, outhouses, wells, cisterns, and other appurtenances, may be made known, the remedy of defects be pushed, and the coöperation and authority of the State Board be exerted wherever necessary to supplement the efforts of the local authorities. Responses have also been received from all the important railway companies operating in the State, regarding their buildings, grounds, passenger cars and other matters. Should it become necessary a sanitary supervision of railway and steamboat travel within the confines of the State and upon its boundary lines will be established and exercised by the Board; and in this, as in other matters affecting the public health, there is assurance of hearty coöperation from these important interests. Public institutions, State, county and municipal, either have been already inspected, or are now undergoing inspection, and the remedy of defects thence disclosed is being prosecuted as far as practicable. An effort will be made during the winter to secure some amendment of the Board of Health Act, and the General Assembly will be asked for the appropriation of a sufficient sum, as a contingent epidemic fund, to place Illinois in a condition to take care of itself if the general government fails to discharge its obvious duty of providing an adequate National health service."—JOHN H. RAUCH, M. D., Secretary State Board of Health.

Indiana.—"On the first of July last our Board issued a general order for a thorough cleaning of all cities and towns and places near inhabited dwellings. This order was served upon every local board within the State, and was generally obeyed. The continued increase of cholera in Europe induced the Board to issue a special cholera circular on the first of August, accompanied by an imperative order to local boards to at once place their respective jurisdictions in a good sanitary condition. At the same time full and explicit directions were given for disinfection, quarantine, etc. Orders were also served at the same time upon every chief railroad official, whose lines of railroad touched our State, to place their properties in good sanitary condition and exercise the utmost precaution against their roads being either an avenue through which cholera could be introduced, or their depot grounds or cars becoming a nidus for the development or propagation of diseases. And an order was also served upon hotel keepers to place their houses in a sanitary condition and keep them so. These orders were generally obeyed promptly and cheerfully, and a thorough disinfection and cleaning was the result. Thus our State was placed in a much better hygienic condition than ever. Yet we are fully conscious that there is yet room for much improvement, and we are constantly urging through the public press and by letters and circulars the absolute necessity of thoroughly cleaning and keeping clean the cities and towns. During the past three months we have issued and distributed five thousand special cholera circulars, twelve thousand preventable disease circulars, twenty-five hundred reprints of the proceedings of the Conference of this body at St. Louis, together with five hundred copies of Dr. Rauch's address. We have held six sanitary conventions; have caused a sanitary survey to be made of every prison and county asylum in the State, together with all the State institutions for the insane, idiots, reform school for boys, etc., beside many private institutions, and are now causing a sanitary survey made of every city and town in the State, and every railroad depot and grounds. So that we feel justified in saying that Indiana is in as good a sanitary condition as any of the surrounding States. However, we appreciate the fact that much can yet be done in the line of sanitary work, and we are pushing the work. We are well aware that our State is peculiarly exposed to the danger of cholera infection if it should reach America. We have suffered severely in each of the epidemics that has prevailed in America, the disease having reached us in 1832, 1848, 1849, 1852, 1854, 1866 and 1873."—E. S. Elder, M. D., Secretary State Board of Health.

Kentucky.—"On the confirmation of the first reports of the outbreak of cholera in Europe during the past summer, the State Board of Health at once began the use of every means at its command to induce local boards of health and the people themselves to prepare to resist an invasion of this disease. * * * A circular of instruction and warning was sent to the health and civil authorities in every city, town and hamlet in the State; and, through the columns of the secular and religious press which has warmly seconded every effort we have made, these circulars were infinitely multiplied and introduced into every reading family in the State. * * * This was followed by systematic efforts to secure perfect organization in every town and county, until no health or civil official under our jurisdiction has escaped our admonition, or can claim that his duty, and the importance and methods of discharging it, have not been laid before him in the strongest and plainest terms of which we are capable. In order to gain information for this report, and to again call attention to the subject, a second circular was issued two weeks ago"—calling for reports as to the steps taken—"looking to the removal of the unfavorable sanitary conditions." * * * "Conceiving it to be my duty to this Conference to state the results of this labor as plainly and unreservedly as has been our custom as a Board in dealing with our own people, I will say that these results have fallen far below our expectations. Exceptions must be made in the case of local boards of health in a few instances; but, as a rule, it may be said that little or nothing has been attempted at all adequate to the emergency. This is certainly true of Louisville, which I have recently inspected personally, and of other important towns about which I have been able to gather reliable information. Should cholera reach this country, sanitary inspectors will be sent out by this Board to every section to urge and assist in the work of preparation, and every other agency at our command will be employed in the same work."—J. N. McCormack, M. D., Secretary State Board of Health.

Louisiana.—"In the month of May, 1884, soon after the present organization of the State Board was effected, it was decided to invite a conference with the boards of adjoining States, for the purpose of considering measures of quarantine protection against foreign pestilence. Accordingly, on June 2, representatives from the State boards of Alabama, Mississippi, Texas, Louisiana and Tennessee, and from the local boards of Pensacola, Fla., and the Gulf counties of Mississsppi, met at New Orleans and held a three days' session"—the proceedings at which have already been published in full. * * * "The appearance of cholera in Europe in the spring of 1884, led to the following resolution, introduced by Dr. Salomon and adopted [by the State Board of Health], July 9th. Whereas, Cholera is known to exist at Toulon and Marseilles in epidemic form; therefore, be it Resolved, That the President of this Board instruct the quarantine officers at all the quarantine stations in the State, to detain all vessels coming from said ports, or any other ports where cholera may exist, until further orders from this Board." On the 17th of July, Dr. Joseph Holt, president of the Board, issued a proclamation based upon the foregoing resolution, and ordering that "all vessels, together with their crews, passengers and cargoes, arriving at the several quarantine stations of the State from the French ports of Toulon and Marseilles, and from any ports that may hereafter become infected with cholera, be detained for observation and disinfection, until such time as, in the opinion of this Board, it may be safe to allow them to enter the port of New Orleans. The quarantine officers of the several stations are especially charged and directed to enforce strictly the execution of this proclamation." * * * "Moreover, particular care is exercised in the inspection of vessels at quarantine from all European ports, which is made only by daylight; and such vessels are kept under surveillance of the Inspector of Shipping while in New Orleans. Up to the present time no vessel actually or presumably infected with cholera has yet arrived, though several from French and Italian ports have been detained from a few hours to two days for inspection and observation. It is proper to add that, since the appearance of cholera in France this year, only one emigrant vessel has arrived at this port from the Mediterranean. During the latter part of November and beginning of December, the Board of Health has consulted with the city authorities and the Auxiliary Sanitary Association, with the view of taking early steps to improve the sanitary condition of New Orleans." * * * "This consultation has been carried on privately, since it has been thought advisable not to alarm the public mind by showing grave apprehension of danger. The object is to commence the house-to-house inspection at an early day, so as to have the whole city front and the most thickly populated localities in good sanitary condition before the return of hot weather. The city authorities evince a lively interest in the matter and a willingness to do all that the financial situation will permit; but they aver that they can not contribute more for carrying out this work until they begin to realize upon the revenues of 1885. At present the sanitary police, on whom devolves the work of making the house-to-house inspections, and the serving and enforcing orders for the abatement of nuisances, is limited to nine men. This number will probably soon be increased to fifteen. The city authorities also promise, at the beginning of 1885, to remedy the present neglected condition of the streets, gutters, drainage canals and other places falling under the jurisdiction of the commissioner of public works, and to make an appropriation for purchase of disinfectants and meeting whatever emergency may arise from an actual outbreak of cholera. In this last event, or should the danger become imminent, the Board of Health will issue instructious for household sanitation, having special reference to choice and preparation of food and drinks, dress, exposure to weather, removal of refuse matter, early medical relief to any derangement of the alimentary canal, and effective disinfection of suspicious discharges. It may be observed, in this connection, that rain water, stored in cisterns, is almost exclusively used in New Orleans for drinking and cooking purposes, which fact is a great safeguard against the whole class of filth diseases. There is no underground sewerage, and the old privy-vault system remains; but the law now requires these vaults not to exceed two feet in depth under the surface, to be watertight, and to be emptied by odorless apparatus. The contents are dumped into a closed boat, which is discharged into the river below the city limits."—S. R. Oliphant, M. D., Member; S. S. Herrick, M. D., Secretary State Board of Health.

Maryland.—"It is gratifying to report that an increased interest in sanitary matters has been awakened among the people of Maryland. Until lately they entertained a very inadequate conception of the laws of health; now there is an obvious tendency to a deeper and more enthusiastic interest in everything that pertains to the protection of the public health. The immunity of our State from epidemic or pestilential diseases has, however, had the effect to reduce the appropriations for the State Board of Health to almost *nil*. Unfortunately, the better we do our work the less our services are appreciated. In preventing disease, boards of health destroy the food upon which they exist, and are then looked upon by the average legislator as useless and expensive bodies. Within the last year the aid of the State Board of Health has been invoked in various communities of the State in suppressing nuisances and in investigating the causes of prevailing diseases, and its action has in every instance been productive of good results. One case is particularly interesting and worthy of mention." This was an outbreak of typhoid fever in Elkton, Md., attributed to a polluted milk supply.—C. W. Chancellor, M. D., Secretary State Board of Health.

Baltimore.—This city is in an "excellent sanitary condition, and quite prepared to keep out, if possible, the dreaded cholera-Asiatica, and to cope with it should it elude, in spite of our care, the vigilance of the health officer at our quarantine station. The station has recently been removed to a position seven miles distant from the city, and is now thoroughly equipped with every modern appliance. Our sanitary laws are being strictly enforced, and every possible source of disease removed." * * * "The privy-well system, which like so many of our sister cities still exists in Baltimore, will in the near future I am confident be done away with, and a proper system of separate sewerage be adopted. The few remaining pump wells must also go, as Baltimore is supplied now with a superabundance of pure and wholesome water."—James A. Steuart, M. D., Commissioner of Health.

Massachusetts.—"The State is represented at this Conference by Dr. H. P. Walcott, Chairman of the Health Committee of State Board of Health, Lunacy and Charity, and Dr. S. W. Abbott, Health Officer of the Board; also by Dr. S. H. Durgin and Dr. A. F. Holt, representing the boards of health of Boston and of Cambridge. We are aware of the important position which Massachusetts holds with reference to the introduction of contagious diseases from abroad. Of the several cities on the sea-board, Boston only holds an important rank as an immigrant port. This port is efficiently guarded by a well-regulated system of quarantine. The health officer has visited a portion of the cities of the State with reference to investigation as to their present sanitary condition, and will continue his investigation throughout the cities and principal towns of the State for the same purpose. Everything will be done that is within the power of the State Board to do to aid in the work of placing the State in the best possible condition to ward off pestilence, and also to combat it, should it once appear within the borders of the State." * * * "Circulars were issued last summer and sent to local boards of health, physicians, and others generally throughout the State, and also for publication in the daily and weekly newspapers of Massachusetts."—S. W. ABBOTT, M. D., State Health Officer.

Boston.—"The efforts of the [city] board have been more successful and attended with less delay on the part of landlords and tenants than usual during the last few months, on account of the cholera epidemic abroad and the fear of its visiting this country. We hope to take still more advantage of this state of public apprehension to rid our city of its thousands of unnecessary privy-vaults and cess-pools, extend our sewers, fill up the low water-covered spaces, place all private courts and alleyways in the charge of the city, and to make many other sanitary improvements which in ordinary times could not be done. Our death-rate this year from all causes will be 22+ per 1,000, the percentage from zymotic diseases 23+, the percentage of deaths under 5 years of age 37+, and the percentage of deaths from diarrhœal diseases to total mortality 8.8."—S. H. DURGIN, M. D., Chairman Boston Board of Health.

Cambridge.—"Soon after the cholera appeared in France last summer, and the danger of its coming here was being discussed by sanitarians, the board ordered a careful house-to-house inspection." This has been completed and many defects and unsanitary conditions have been remedied. "Should cholera appear in this country in the coming summer this work of inspection will be again taken up and prosecuted in the most intelligent and thorough manner."—A. F. HOLT, M. D., Health Officer.

MICHIGAN.—"In Michigan, as elsewhere, public-health work rests largely on the local authorities, to whom belongs the authority and the responsibility for whatever may need to be done in any given locality. As there are a great many local health officers in Michigan (in the jurisdiction of any one of whom cholera might occur), it is impossible to say beforehand what would be done in a locality in the emergency of an outbreak of cholera. This may be said, that as the State Board of Health has during more than ten years been urging the better organization of local boards, and better work by them and by the people, who are required to report to them diseases which endanger the public health, and as the State Board has thereby secured on the part of local boards a completeness of organization and an efficiency of work far in advance of what had been attained in the State before, there seems to be laid a good foundation of preparation for any outbreak of cholera which may occur. There is now an organized board of health in every city, village and township in the State, and nearly all of them (1,158 out of 1,391 for the year 1884-5) have complied with the law which requires every local board of health annually to appoint (or reäppoint) a health officer and to report to the State Board of Health his name and address, and promptly to fill any vacancy which may occur. The State Board has published and distributed to all the local boards a pamphlet containing the addresses of all the health officers in the State; and thus local boards have a ready means of communicating with each other in time of danger.

"The discipline of local boards of health in Michigan has been greatly promoted by the work of the State Board in connection with the constant presence, in different parts of the State, of scarlet fever and diphtheria, and the occasional presence of small-pox, in dealing with which local boards have, under the direction of the State Board, obtained much practical information as to the nature of communicable diseases, their modes of communication, and the best means for suppressing them.

"Local boards of health have learned by experience that communicable diseases may be controlled, and that by prompt action on the first appearance of such a disease they may avert what otherwise would be a widespread calamity. Scarlet fever, diphtheria, and small-pox are different from cholera; but men, educated to their responsibility as health officials, and trained to deal with these diseases promptly and intelligently, are thereby in a much better condition to learn the ways of cholera and to deal with it successfully.

"The wide distribution, by the State Board of Health and by local boards, of popular documents on the restriction and prevention of the diseases just named, and on the duties of local boards, physicians, house-holders, and the people generally, with reference to these diseases, has done much to educate both health officials and their masters, the people, as to what they may and should do to avoid or suppress communicable diseases.

"As a class, the physicians of Michigan recognize the importance of the work done by intelligent boards of health, and coöperate therein. Health officers have not, as a rule, trespassed on the domain of the family physician, and the physicians have learned to respect the officer, who, on the outbreak of a dangerous communicable disease, appears as the representative of the interest of the people; and by hearty coöperation with the health officers they have not only strengthened their own influence, but have built themselves into the public-health service of the State, in a way that demands on the part of the people and of the State Board of Health courteous acknowledgment. The law which requires that, where practical, the local board of health shall appoint a well-educated physician as health officer, and the more recent law which provides compensation to the physician for his trouble in giving the health officer prompt notice of a case of communicable disease, dangerous to the public health, have helped to bring about this good will between physicians and local boards of health—a most desirable condition in time of great danger.

"The fact that the Michigan Board of Health has for some time been trying to educate local boards and the people as to what they may well do for the prevention and restriction of typhoid fever, by cleanliness of towns, and by protection of the water-supply from all sources, and that it has recently enlarged its work in this direction, has done something to prepare the way for the needed instruction with regard to cholera.

"Taking advantage of the popular interest in the subject, the Michigan Board distributed last summer to local boards of health and others a large edition (20,000 copies) of a document calling attention to the real sources of danger from cholera, and to proper means for preventing and restricting it; and this distribution was supplemented by the preparation of a special circular on the subject, which was issued by the Commissioner of Railroads to all railroad officials, agents, and employés in the State. At least one city in the State has reprinted and distributed to its own people our general cholera document, as a means of educating the people to the duty of the hour.

"I hope I have not overdrawn my statement of the preparation in Michigan for the coming of cholera, and of the efficiency of the health service of the State. There is yet much ignorance of what should be done, and of what has been done to prevent sickness. There is much apathy among the people, inefficiency and indiscretion on the part of officers; but there has been improvement in the direction which all public-health work must take to be lasting and complete, namely, in the education and instruction of the people; and it is believed that in most intelligent communities in Michgan there is an educated sentiment with regard to dangerous communicable diseases, which sentiment is capable on demand of doing much towards controlling cholera should it appear. The increased and increasing facilities of communication between local boards and the State Board improve the situation. The success already attained encourages us to look to the further training of local boards, and the more general education of the people, for the accomplishment of one great end in view, namely, ridding the State of dangerous communicable diseases.

"Except in certain cities and villages, where special charter provisions may conflict with the general law in Michigan, local boards of health audit their own expenses, including the salaries of the health officers; and yet in an emergency requiring prompt and unusual expenditures, they are likely to be crippled for want of the 'sinews of service,' because of there being no money in the treasuries upon which their orders must be drawn. In some localities there might be danger that, because the burden was a local one, an unfortunate economical policy might prevail; and while great epidemics of cholera do not usually occur where there is not also a large population to bear the expense of controlling them, yet the correct principle would seem to be that dangers which threaten many should not be left for the few to battle with unaided. When, in 1879, Congress appropriated $500,000 as a contingent epidemic fund, to be used at the discretion of the President, if necessary to prevent the introduction or spread of contagious diseases, I believe it established a precedent which might well be followed by State legislatures. The expenses attending the stamping out of a local outbreak of an epidemic disease which threatens the State or the nation may well be provided for by the State or nation; and if such provision has not been made by the State or national legislatures, the people will know where to charge the blame in case unaided local authorities shall be found incapable of successfully battling with such an outbreak.

"We do not make cholera or small-pox in Michigan; we have not yet learned how. And if we could be protected against the introduction of dangerous communicable diseases from other countries and other states, or if we were allowed to protect ourselves by such a tax on suspected travelers as would pay the expenses of an adequate inspection service, we would ask little or nothing of the general government. But situated as we are on the great highways of immigration to the whole northwest, and having a port (Port Huron) second only to New York in number of immigrants received, we justly feel that the power which claims the exclusive right to tax the immigrant should bear the expense of the needed inspection, which would be not for the benefit of Michigan alone or chiefly, but for the benefit of a large portion of our country."—HENRY B. BAKER, M. D., Secretary State Board of Health.

MINNESOTA.—"The State Board of Health of Minnesota has direct communication with twelve hundred (1200) local authorities in the State, who compose the local boards of health, or who appoint such boards. In the event of the occurrence of epidemic disease in the State, this board has certain powers defined in the statutes of the State, which express the duty and intention of the Board, should occasion demand the exercise of the authority so imposed. This Board has called a conference of State with local boards of health at the Capitol in January, 1885, at which time it is proposed to consider what further legislation, local as well as State, is necessary for the more efficient organization of local boards of health, and the performance of local sanitary work. At the same time a popular sanitary council will be held in the evenings for the consideration of sanitary questions, water supply, the disposal of garbage, excreta, etc. Impending and possible epidemics will receive due consideration. As respects the contingency of epidemics, the Governor and this Board have asked of the Legislature an epidemic fund, similar to one voted two years ago, to be disbursed by the Governor on requisition of this Board. We have further asked that this Board be made the guardian, with local boards, of the water-supply of the State, and with them have control of offensive and dangerous trades, which legislation will probably be had, with an increase in the appropriation for the Board." * * * "From this brief statement may be inferred the preparation made by Minnesota for the prevention and control of epidemic diseases, including Asiatic cholera."—C. N. HEWITT, M. D., Secretary State Board of Health.

MISSOURI.—"Numerous county boards of health and medical societies have sprung up since the organization of our State Board. In the early spring we prepared a circular giving full information as to the establishment and management of these boards, which met with general favor throughout the entire State. We get a great deal of valuable information and support from these organizations at this time." * * * "On account of not having a sufficiently large appropriation, we have been somewhat hampered, and have worked under great disadvantages, but with the present prospect of cholera making its appearance in this country, we are confident that our legislature will give all the money that is necessary to fully carry out our line of action, and thus give greater security to the public health against contagious and epidemic diseases."—J. C. HEARNE, M. D., Secretary State Board of Health.

St. Louis.—"The St. Louis Board of Health has not been idle in preparing for the threatened visit of Asiatic cholera; at the same time we trust that this Conference will succeed in convincing Congress of the necessity of a National authority to guard our sea coast by a strict maritime quarantine. We consider it the duty of the National government to protect the country against the invasion of epidemics, and to see that, if the barriers established at the sea coast should prove inefficient to keep an epidemic from our shores, the measures taken by State authorities should be uniform and not interfere with the interstate commerce. In order to prepare the city for the advent of cholera, if it should come, we propose to inaugurate a house-to-house inspection as soon as the money necessary to carry it out is provided by the city government. This inspection is intended to include the close examination of houses, cellars, yards and alleys, the condition of the plumbing, the water closets, sewer connections, etc. An ordinance has now been introduced providing for a board of plumbing examiners and the appointment of three inspectors of plumbing who shall be practical plumbers. The city is very well sewered and our sewer system is as perfect as any in the country." * * * "Our water-works furnish excellent water." * * * "We have, however, a good many wells in the city which may become a source of danger during an epidemic. An ordinance is now before the municipal assembly, which will give the board of health the power to close any and all wells which are subject to or suspected of contamination with sewage. Heretofore the water of a well had to be analyzed before the board could condemn or close the well. We have also introduced an ordinance which requires all burials, of persons who died of contagious or infectious disease, to be private, and to take place within eighteen hours after death. Physicians are required to report all cases of contagious or infectious diseases to the Health Commissioner at once." * * * "In case of an epidemic our board of health has extraordinary powers to suppress and confine the disease, and we intend to make free use of them if cholera should appear in our city."—JOSEPH SPIEGELHALTER, M. D., St. Louis Board of Health.

NEW HAMPSHIRE.—"During the past season we, like many other State boards, issued a circular setting forth the liability of cholera in this country, even in our own State, and have urged upon persons and local boards of health the importance of sanitary work. The disease once invaded our State, and the result was several deaths in the city of Manchester, so we feel that, although among the granite hills and fertile valleys of northern New Hampshire, we are not beyond its dangers. The subject of maritime quarantine, about which, in addition to Dr. Smith's excellent and able paper, much has been said at this meeting, is one of interest to our State, for we have within our borders the port of Portsmouth, with its navy yard, at which twenty six vessels landed during the past year from foreign ports. While this may be regarded as a diminutive affair, it presents some liabilities which at least give us no small interest in maritime quarantine. Interstate quarantine is also a matter which comes within our consideration, from the fact that Maine upon our east and Vermont upon our west borders have no State health departments. [A State Board of Health has since been organized in Maine.] Many emigrants during the winter months land at the port of Portland, and are shipped directly through the northern portion of our State into Canada and the West by the Grand Trunk Railway, hence a portion of our State is exposed, in a small degree perhaps, to the dangers that are brought to any community by emigrants from infected localities abroad."—IRVING A. WATSON, M. D., Secretary State Board of Health.

NEW JERSEY.—The Secretary of the State Board of Health, Dr. Ezra M. Hunt, made a brief verbal report of the preparations made and the precautions which would be enforced in the event that Asiatic cholera should make its appearance on this continent.

NEW YORK.—"The cities of New York and Brooklyn contain nearly two million of the five millions of people in the State. All the 224 villages and nearly all of the one thousand towns have local boards of health. Constant and earnest efforts are made by the State Board, through correspondence, reports, and in the work of experts and inspectors, chiefly local, to perform necessary local work. The best public opinion is largely in sympathy with this kind of work, and the result, after four years' education and experience, is almost a revolution in the progress made in popular knowledge and official practice. The State appropriates but $20,000 yearly for the State Board, but the great cities make more satisfactory provision for their own more important examinations. The State Board is always ready with advice, instruction, and, as far as possible, with material aid and assistance." * * * "Much of the work in New York comes from executive reference and direction, and an important part of it also from State legislation when seeking information as to drainage, sewerage, and diseases. In regard to the possible and expected coming of the scourge of cholera, the State at large, the Board hope, is as well prepared as possible to meet the disaster, so far as relates to warning, information, and constant vigilance. The consequences of neglect are fully known. The duty of all connected with corporations, factories, workshops, families, homes and persons is too plain to need report or discussion. The members of the New York State Board will endeavor to perform their duty, and trust to the people, stimulated and directed by a wise Providence, to perform their obligations as citizens of the State."—Hon. Erastus Brooks, State Board of Health.

Brooklyn.—Dr. J. H. Raymond, Health Commissioner of Brooklyn, presented an elaborate report upon the sanitary conditions of that city—its water supply, ponds, privy vaults, disposal of night soil, sewerage system, Italian quarters, lodging houses, laundries, food supply, etc.; and upon the preparations and provisions to meet an invasion of cholera—medical inspection, hospitals, quarantine, etc. In closing his report Dr. Raymond submitted "to the Conference for its consideration and ratification, if approved, the following propositions: *First.*—That all surface wells should be closed at the earliest possible moment, and that great care should be taken that the water-supply of all cities, towns, and villages shall be of undoubted purity. *Second.*—That all privy vaults should be abolished wherever water-closets can be supplied, and that wherever the existence of such vaults is necessary that they should be rendered water-tight in such a manner as to prevent the saturation, not only of the ground surrounding them, but also of the materials of which they are built, and that the contents of such vaults should be kept constantly disinfected, and removed to a proper place at frequent intervals. *Third.*—That all stagnant ponds should be disinfected, and when possible the water removed by drainage or pumping, and the further accumulation prevented by filling with fresh earth or other material free from garbage or other filth. *Fourth.*—That great care should be exercised to keep at all times clear and free from obstruction all sewers into which passes the refuse from dwellings, factories, and other buildings, and that such examinations should be made as will detect imperfect plumbing in all buildings and the defects immediately corrected. *Fifth.*—That extraordinary care should be exercised in reference to all tenement houses, lodging houses, and, in general, all places where large numbers of human beings congregate, that no accumulation of garbage or other filth be permitted in cellars or yards, and that frequent and thorough cleaning and whitewashing of such structures be required; and that householders should frequently and thoroughly examine their yards, cellars, closets, and other out-of-the-way places to see that no filth of any kind has been deposited there. *Sixth.*—That the food supply be vigorously watched to exclude from the market all unwholesome meat; all milk adulterated or from diseased animals; and all unripe fruits and vegetables; and that cow-stables be kept, at all times, clean, well whitewashed, and free from all excremental accumulations. *Seventh.*—That all garbage, kitchen and household refuse should be promptly removed from dwellings, stores, and other buildings to a proper place where it may be destroyed by fire or otherwise disposed of in such manner as to occasion no nuisance. *Eighth.*—That such material should never be used in the filling of lots or disposed of by throwing the same in streets or on vacant property where it may decompose and exhale offensive and deleterious gases. *Ninth.*—That in view of the practical results reported by that eminent sanitarian, Edwin Chadwick, Esq., C. B., the authorities of all public institutions, and individuals as well, have their attention drawn to the great importance of the personal cleanliness of those committed to their charge, as one of the most efficient means of warding off an attack of cholera, and of reducing its force when once it has appeared. *Tenth.*—That all authorities of States, cities, or villages be urged to adopt measures which will result in the amelioration of all conditions such as have been referred to in the foregoing propositions, with the warning that in the opinion of this Conference such conditions, if permitted to continue, will greatly promote the spread of cholera when it comes, and with the assurance that if requisite measures are promptly taken to remove them, the disease will be less likely to attack a community so prepared, and if attacked such a community will be better able to cope with the disease and to reduce its ravages to a minimum."—J. H. Raymond, M. D., Health Commissioner.

Syracuse.—"In dealing with cholera questions in Syracuse, we have acted, and shall continue to act, for the present at all events, in accordance with accepting as a fact the 'greatest probability' as to the genesis of cholera. In doing so we feel we shall act with more decision and accomplish much more telling practical work. We shall then continue to act upon the belief that the genesis of cholera in a new place depends upon the fact that bacilli, perhaps the comma-shaped bacilli of Koch—specimens of which were kindly shown us yesterday by Surgeon John S. Billings—or perhaps some other of the schyzomycetes, have been carried from the intestine of an individual ill with cholera by some one or more of countless means, and finally, through the mouth, to the intestine of the newly-afflicted person. Therefoie we shall try to prevent the germs entering our city. * * * We shall try to furnish them as small an amount of soil as possible in which they may grow and multiply, * * * and we shall try to kill the germs, if they find their way into Syracuse, by the use of such germicides, as we expect Dr. Sternberg, so soon as he is able to do so, to suggest as a result of his laboratory work in the Johns Hopkins biological department; and at the same time we shall give proper attention and care to the sufferers in whom the germs may be resident."—A. CLIFFORD MERCER, M. D., Health Officer.

NORTH CAROLINA.—"As far as the machinery of our Board is concerned, it has many good points. It provides a Superintendent of Health for each county, and this officer in our sparsely settled counties can easily fulfill the functions of sanitary supervisor and physician. The law provides that he shall be a physician legally authorized to practice. Our endeavor is to get from the next legislature such amendments as will give the Superintendent an adequate salary for work in each county. If this can be done, and an appropriation is given to the State Board, as I believe it will, we shall have some showing for an organization against cholera. We do not feel much alarm about cholera and epidemics in general in North Carolina. Over a hundred years ago Cornwallis brought small-pox into the State, and we were somewhat exempt until Sherman brought it in in 1865. For fifty years we have had no cholera except three sporadic cases, which occurred in Wilmington in 1868. But as all evils bring good to somebody, I trust that the threatening of cholera invasion may stimulate the next legislature to aid the whole work we have undertaken, and supply us with a contingent epidemic fund." * * * —THOMAS F. WOOD, M. D., Secretary State Board of Health.

OHIO.—The Health Officer of Cincinnati reported upon the general sanitary condition of that city—its water-supply, sewerage, privy vaults, meat and dairy inspection, etc. "The sanitary force of twenty men is divided, so that a sufficient number attends promptly to all cases of contagious disease; the rest are attending to the inspection of houses, yards, cellars and premises, and the abatement of nuisances. For this purpose, the city is divided into districts, one inspector being assigned to each, and it is made the duty of each to inspect houses, measure depth of vault, contents, etc., and to report the result in writing each morning. The cleaning of our streets and the removal of garbage are not satisfactory, largely because the Board of Public Works is not provided with sufficient funds to do the work properly. This would be our greatest danger in case of the advent of cholera; but should such an emergency arise our Board of Health would appeal to the public for the means with which the cleaning of streets and alleys, and the prompt removal of garbage would be secured. I do not doubt that our citizens would promptly and cheerfully respond to such an appeal. Mr. Chairman, permit me to say in conclusion that my disabilities, as a layman, are greatly mitigated by the fact that you are also numbered with me."—C. W. ROWLAND, Health Officer.

Dayton.—Supplementing a detailed sanitary history of the city, the health officer added: "Dayton being an inland city will of course not be expected to perform any special or direct work in the way of National quarantine. If cholera can develop in the United States only by transportation from foreign countries, our complete protection will depend upon the efficiency of the coast quarantine. It is therefore highly important that a more perfect understanding of international quarantine be obtained, and that a more rigid enforcement of the law be employed. With a critical application of a thorough system of international quarantine, a uniformity of interstate action and sanitary vigilance on the part of municipal authorities, we may reasonably anticipate a very modified form of the disease, if we do not escape it entirely. Such local or immediate quarantine and protection as may be necessary to the modification or prevention of cholera in the city of Dayton will be promptly employed and rigidly enforced. Realizing the danger to which our vault system exposes us, we will endeavor to procure such change and improvement in the system as the circumstances will permit. In case cholera should reach Dayton we will not be wholly unprepared for it. The citizens have been and will continue to be, from time to time, warned of the probability of the introduction of cholera. Circulars relating to diet, care and attention to the system in health, as well as the symptoms and treatment of the primary stage of the disease, will be placed into the hands of every one. The location for hospitals, together with plans for their general operation and management, has been fullv considered. Taking all things into consideration, Dayton may be considered as being fairly prepared for the anticipated epidemic."—A. H. IDDINGS, M. D., Health Officer.

PENNSYLVANIA.—Since the date of the meeting a State Board of Health has been established, but at the Conference only the cities of Pittsburg and Erie were represented. Crosby Gray, health officer, furnished a paper upon the "Present and Prospective Sanitary Condition of Pittsburg;" and Dr. Germer, of Erie, since appointed President of the newly-created State Board of Health, made the following remarks: "Our city was visited long before others by the Asiatic cholera in June, 1832. A woman died on board of a ship, which was taken to quarantine in 'Misery Bay', where several others died. The woman came from Quebec and washed the clothing of her husband, who had died during the voyage from the old country. The citizens got pretty well scared and opened a shotgun quarantine and permitted nobody to land. After that the cholera appeared in other lake cities

In 1854 another case was reported. In 1873 a whole family got sick with symptoms of Asiatic cholera, and created quite an excitement. By a close examination, I found that they had eaten pork full of trichina spiralis, and, after giving their pork and sausage to the scavenger, the disease made no more trouble, but the people got a little suspicious about certain kinds of pork." * * * * "We had two small-pox epidemics in 1872 and 1882, breaking out in our rag-shops, and I orded a wholesale vaccination. There used to be an old-fashioned Pennsylvania pest-house in our city, which fitted exactly Dante's inscription over the portals of hell: '*Lasciate ogni speranza, voi che entrate!*'—'You'd better make your will, and give up all hopes of recovery, before you go in there!' I disinfected that horrible institution one evening with ten gallons of petroleum and a match. We have now a new hospital for contagious diseases and two other good hospitals; besides these we have the great marine hospital building, which cost over $100,000; and was never used for anything. In case of emergency our skating-rinks would also make pretty good cholera hospitals. The better houses are all provided with modern sanitary improvements. The few old privy vaults I disinfect generally with a wheelbarrow full of gas lime, fresh from the gas factory. This will disinfect the contents of the vault, and at the same time spoil every well within a radius of 100 feet, and give the people a fair warning not to drink such water. This is a very cheap disinfectant for such purposes; a great many of the other disinfectants don't amount to more than a prayer meeting against the grasshoppers in Kansas. If we want to disinfect, it is no use to do it in a homeopathic way, for at Naples, in Italy, and at Colima, in Mexico, hundreds are dying with cholera and yellow fever in spite of the near volcanoes which are filling the air with sulphur and smoke. Sanitary science is still a baby, but growing rapidly. We have a great many rich communities, where the people think they have reached the highest point of civilization if they have a hose cart and fire engine, and where the sanitary officer is regarded as an unnecessary appendage to the local government. The people in general do not realize to what an extent public health depends upon the man who has to fight the milk-diluter, the poisoned-candy maker, the counterfeiter of butter, and the importer of rags and other articles which destroy or shorten human life. I hope the time is coming when every intelligent community will not only appoint a health officer, but furnish him also with a good microscope and chemical apparatus for his researches. It is no use to fill such places with retired politicians. Our consuls in foreign countries ought to have decent salaries, to enable them to watch the ships leaving for America, and to see that no contagious diseases are brought to our country. Young, well-educated physicians would answer for that purpose. We want a National Board of Health composed of wide-awake men, and there will be work enough to keep them busy."—ED. WM. GERMER, M. D., Health Officer.

SOUTH CAROLINA.—"Our State Board of Health * * * has paid special attention to the quarantine regulations of the State, supervised all the stations, repaired most of them, and has purchased a site on Buzzard's Island and erected buildings thereon. Recently it has given much attention to the cholera question, has published circulars which were sent to each of the sub-boards and scattered broadcast in the State, by which they endeavored to impress upon these boards and the public that an epidemic might be prevented altogether or greatly mitigated by proper attention to cleanliness in person, premises, water-supply—cleanliness in everything. The sanitary condition of the State is good so far as the cities and towns are concerned, but the condition of the interior is not so good. The sub-boards have not as yet become acquainted with the benefits which their reports afford, and consequently these reports are not as numerous and regular as could be wished. A system of vital statistics has been provided. All the charitable and penal institutions have been visited. Sanitary inspectors' reports have been made—in a word we have earnestly and faithfully endeavored to discharge all the obligations imposed on us by our health laws. We are now, and, until all danger is past will continue to be, actively engaged in warding off the threatened epidemic of cholera, and in preparing to combat it, should it appear within the limits of our State."—J. FORD PRIOLEAU, M. D., State Board of Health.

Charleston.—"The present sanitary condition of Charleston is excellent and the mortality for the month of November among the whites exceptionally low, being under 20 per 1,000. It is not so, however, with the colored race; from their improvidence they suffer very much more, and no provision being made by them for the care of the helpless of their race, either old or young or sick, many succumb to disease which would not otherwise suffer." * * * "Charleston is exceptionally well situated for the disposal of deleterious matter, being on a tongue washed by salt water on three-fourths of its area. There has been ordered, and is now being carried out, a careful house-to-house sanitary survey of the city, including cesspools, privies, drains and surface deposits. A daily written report is received from our sanitary inspectors, and all collections of filth are removed and places disinfected." * * * "The scavenging system is most efficient. The carts being owned by the city, are used in the early morning for the removal of garbage, and in the afternoon for the city hauling work. Every day the garbage is up before midday. Very stringent orders have been given and are enforced at quarantine, the administration of which is under the Board of Health of Charleston. All vessels arriving from France, Italy, Spain, and ports of the Mediterranean are thoroughly cleansed and disinfected with bi-chloride of mercury, and then fumigated with sulphur fumes. All foreign vessels whatever are very carefully examined."—H. B. HORLBECK, M. D., Health Officer.

TENNESSEE.—Tennessee is perhaps as ready to meet an invasion of Asiatic cholera as any of the United States. As far back as 1833 an intimate acquaintance with this scourge of the nineteenth century was formed. Lovely country towns like Shelbyville were decimated, while its capital city, Nashville, ranked with Lexington, Kentucky, most noted among all the cities afflicted. In 1873 twenty counties, extending from the southwestern frontier bordering on the State of Mississippi to the northeastern line coterminous with Virginia, were laid waste. The Tennessee public knows full well the brief but emphatic logic of history. Never has Asiatic cholera prevailed as an epidemic in Western Europe without crossing over to America. Never has it reached America without desolating Tennessee. The great epidemic of 1873 deeply impressed the entire Tennessee community. The authorities were called upon to establish boards of health, looking to the prevention, or at least the mitigation of epidemics. The city governments of Nashville and Memphis soon responded to this demand, and in March, 1877, the General Assembly created the State Board of Health with limited powers and no funds. In 1878 happened one of the most remarkable chapters in all the weird history of epidemics. Memphis, once the city of refuge for the stricken people of New Orleans, became the scene of woe and suffering, not surpassed by the vivid pictures of Thucydides, Boccaccio, or DeFoe. Tennessee, by nature a paradise, became known to all the world as the theater of yellow fever in its worst form, received the sympathy of Christian prayer in the hamlets and villages, towns and cities of the great Republic, and such overflowing relief in money as never yet has been surpassed for promptitude and whole-heartedness. This terrible lesson was not without its compensation. In March, 1879, the General Assembly enlarged the powers of the State Board of Health and endowed it with means sufficient to make these powers effective. Likewise the National Legislature awoke from its long lethargy and created a Board of Health, March 30, 1879, in harmony with the powers and usages of the local or State boards then rapidly multiplying. The ink was hardly dry upon these respective statutes before the second great Memphis epidemic broke out and demonstrated the wisdom and practical utility of such machinery for applying the resources of sanitary science to the wants of populous communities. The National Board and the State Board co-operated with perfect harmony. Terror was averted. The tender mercies of Christian charity, and the magnificent resources of medical skill were extended without stint to the afflicted, and the epidemic did not spread. As a result of this deeply significant chapter in recent epidemiology the people of Tennessee have great confidence in boards of health, State and National. They look to these boards as official exponents of medical and general science in relation to the prevention of disease. They are ready to follow the advice and directions of these organizations promptly and thoroughly, knowing full well that in common with all branches of theoretical and practical science, the God-like art of healing has made astonishing advances since the epoch of 1881. The Tennessee State Board of Health, appreciating the heavy responsibility resting upon it, because of the popular confidence it enjoys, immediately upon the news from France early in July last commenced its work of preparation. Ten thousand copies of carefully prepared circulars were sent out so as to reach each one of the magistrates and other civil functionaries in the State. Every physician, pharmacist, dentist and clergyman was also supplied. Said circulars have been widely copied by the leading newspapers and thus the entire community has been awakened. Systematic correspondence has been opened with mayors of over one hundred towns in the State, and with the chairmen of all the county courts, looking to the speedy organization of local boards. Encouraging responses are rapidly coming in pledging immediate action. Hence it is safe to believe that in case Asiatic cholera should once more visit the University State of the South, that it will be met with the calm self-reliance becoming a people blessed with Christian hope and the splendid resources of modern science."—J. BERRIEN LINDSLEY, M. D., Secretary State Board of Health.

Nashville.—"The reports of the representatives of the various cities have thus far been very gratifying. The sanitary condition of all of them is represented as being nearly perfect. I wish that I could make a like favorable report of the city that I have the honor to represent; but the facts will not warrant me in doing so, and if I comprehend the object of this Conference, we want nothing but plain naked facts, without embellishment or evasion." * * * "The sources of greatest danger with which we have to contend, exclusive of foreign invasion, are, 1st, an impure water-supply; 2d, imperfect and insufficient sewerage, and in consequence thereof, privy-vaults, cess-pools, etc. Our water-supply is from the Cumberland river, which stream flows through the city and would furnish comparatively pure water, if drawn some distance above the city." * * * "As to the second source of danger, I would say, that all of the sewers in the city, except those built during the past three years, are worse than none, being simply trenches cut in the ground and covered with slabs, earth or rough masonry. With this relation of facts, it is not difficult to understand why Nashville has always been a sufferer whenever cholera has invaded this continent. The board of health is doing everything possible to encourage and facilitate the construction of approved sewers, and wherever they are built, property owners are compelled to clean, fill up and discontinue the use of their vaults, and connect their premises with the sewer by a water-closet arrangement. In localities where sewers cannot probably be built for some time, all surface and faulty privies are condemned and owners compelled to construct vaults not less than three feet deep, three feet long, and one and a half feet wide, (inside measurement when complete), walled up with stone or brick laid in hydraulic cement, so as to hold water and securely retain its contents."—CHARLES MITCHELL, M. D., Health Officer.

Memphis.—Dr. G. B. Thornton, member of the State Board of Health and president of the local board, spoke briefly upon the general sanitary improvements in Memphis, with which he presumed most sanitarians had already made themselves familiar. The water supply and the reclamation of the Gayoso Bayou and Wolf river, were not yet satisfactorily adjusted. The "Taxing District" would rely, for the exclusion of cholera, upon the same agencies which had been resorted to with reference to yellow fever during the past four years—namely, as good a sanitary condition internally as could be obtained and a rigid system of inspection during the danger season and of quarantine upon the first suspicious symptoms.

TEXAS.—In the absence of the State Health Officer, an interesting description of Galveston was furnished by Dr. Penny, who closed his remarks by saying that "an opinion prevails here that cholera cannot become epidemic; this opinion is based upon the fact that when it prevailed in the interior of the State that it did not spread in Galveston; but the conditions are entirely different here now to what they were when cholera last visited this State. There is nothing being done in the way of preparatory work in local sanitation, although an enormous amount of work is needed. Should cholera make a lodgment on this continent, money will then be furnished to do the work that should be done at this time."—WILLIAM PENNY, M. D., Health Officer, Galveston.

VIRGINIA.—Dr. J. G. Cabell, Health Officer of Richmond, said that the annual appropriation of $10,000 made by the city authorities was not sufficient by half. The city at present is in a filthy condition. He said the death-rate among the colored population was so large as to excite the pity and commiseration of the whole community. He attributed it not to constitutional peculiarity, but to poverty.

WEST VIRGINIA.—Dr. J. E. Reeves, of the State Board, said that, in spite of the statement of the health officer of Wheeling, recently made in the public press, to the contrary, the sanitary condition of Wheeling was now deplorable. The refuse of 12,000 people was emptied in and about the head of the water-supply of the city. He had endeavored to cultivate a cholera fright, and he believed that the effect would be good, and that the source of the water-supply would be moved three miles up the river beyond the point of contamination. Last year the total expenditures for sanitary purposes in Wheeling was the magnificent sum of $327. He had recommended that women be appointed as inspectors in each ward, and he believed this would have good results.

WISCONSIN.—"With regard to the cholera, this Board, in August last, issued a 'Cholera Circular,' packages of which were sent to the health boards * * * in every part of the State. This circular stated the prevalent fear that cholera would reach this country, and urged general measures of sanitation, both private and public, as measures of prevention. The same circular was sent to the newspapers of the State, and by them multiplied many thousands of times, so that it reached a very large proportion of the reading people of the State. It was also sent to railway officials, with a special circular addressed to them urging cleanliness about stations, cars, etc., both in the interests of the public from a sanitary standpoint, and in their own interests from a pecuniary standpoint. All of these circulars were regarded and stated to be preliminary to additional ones, to be issued should cholera appear in this country. Among the more noticeable items of sanitary work recently done in Wisconsin, I may mention that in one of its cities—the city of Green Bay, which contains a population of 9,000 to 10,000—the future construction of privy vaults has been prohibited by ordinance. This city has no public water-supply, and the facilities for the drainage of a large part of it are bad. The sanitary authorities, recognizing the fact that this season its wells were in great danger of pollution, and not feeling strongly enough entrenched to order the entire abolition of privy vaults, have, nevertheless, positively prohibited the construction of any new ones on private premises, and have filled up those connected with public buildings, substituting for them the dry-earth system. Wisconsin has recently suffered from small-pox, which was brought to it in a way that suggests the possibility that cholera or any other contagious disease may first develop itself in an inland State in the persons of emigrants, in whom the presence of infection may not be recognized at the seaboard. In this case an emigrant family had landed from a German steamer, had passed the port of entry without detention or suspected danger; yet within two days after their arrival the father and, following him in rapid succession, other members of the family, came down with small-pox. The lesson taught by such cases is the need of constant vigilance on the part of health officers at all places where emigrants to this country first land, lest not only small-pox but cholera come to us of the interior in infected persons, clothing or baggage."—J. T. REEVE, M. D., Secretary State Board of Health.

DISTRICT OF COLUMBIA.—"Washington is an inland city, and must be guarded against exotic diseases by inspecting railway trains, as the water entrance is protected by the quarantine station near Cape Charles. We place more reliance, however, on the strict enforcement of our local sanitary regulations than on quarantine. The germs of disease may escape the observation of the most vigilant quarantine officer, but if our homes and cities are in the condition they should be, they will find no soil for their growth and development. Washington is in an excellent sanitary condition now, and with the completion of our systems of water-supply and sewerage, and the reclamation of the Potomac flats, it will not only be the most beautiful but the healthiest city on the continent."—SMITH TOWNSHEND, M. D., Health Officer.

CANADA.—After reciting the judicial powers of the Federal and Provincial governments with reference to quarantine, the following were stated to be the "Precautions taken by the Ontario Board of Health since the danger of invasion of cholera became imminent. In addition to the ordinary sanitary precautions of public and personal cleanliness pressed upon all local sanitary authorities, the following have been supplemented: 1. Frequent articles in leading public journals regarding the urgency of efficient Dominion quarantine and correspondence with the Minister of Health at Ottawa on the subject. 2. Circulars to all cities, towns and villages requesting immediate information on local sanitary conditions. 3. A careful consideration of the dangers from cholera at the August quarterly meeting and the adoption of resolutions, twelve in number. 4. The communication of these to the Dominion Government and to the several Provincial Governments of Manitoba, Quebec, New Brunswick, Nova Scotia, Prince Edward Island and British Columbia. 5. Attendance at the St. Louis Conference, and the repeated urging of the report adopted by it on the attention of the Dominion Government. With reference to the amount of local sanitation accomplished by the Board, it may be stated that local boards have reported the nature and extent of their organization from almost every city, town and village in the Province and from nearly half of the townships, many of which are very sparsely settled. Nearly 75 per cent of the total population is under sanitary control. These boards, being required by the act to make annual reports to the Provincial Board, have already sent in over one hundred reports, many of them voluminous and displaying surprising progress in local sanitation since the passage of the new Health Act." 6. * * * A fourth outbreak of small-pox in the Province of Ontario since January, 1884, each one clearly traceable to immigrants from Europe, in whom the period of incubation of the disease had not expired at the time of quarantine inspection at port of arrival, but developed in transitu from seaboard to the place chosen for settlement, was cited as "demonstrating the absolute necessity for suitable houses of detention for all passengers who, when a case had occurred on board, might possibly have been exposed to the contagion, and thus, for the safety of the passengers in the cars,they would be traveling en route for their ultimate destination, as also for the inhabitants of the location they have fixed on, should be for a period of fourteen days under observation in properly furnished buildings at the quarantine station of port of arrival." * * * —CHARLES WM. COVERNTON, M. D., Chairman Provincial Board of Health of Ontario.

Quarantine.—Having presented to the Conference copies of the Laws and Regulations relating to Quarantine in force in Canada, including the Special Regulations issued last summer in view of the threatened visitation of cholera, the Chief Quarantine Officer made the following remarks: "As I am called on to speak I may say, as for myself alone, that if possible our quarantine laws are not yet quite perfect. If we have not, perhaps, as yet arrived at securing the maximum protection of the public with the minimum interference with trade and commerce, I trust that in our endeavors to do so our hands may be strengthened by the results and conclusions of this Conference. Our system of maritime quarantine is a national one, all matters relating to it being under the control of the Federal Government, so that a certainty of concerted action at all our ports is secured. It seems to me most desirable that there also be, if possible, mutual agreement betwen the Canadian government and the authorities which control quarantine matters at the different ports of this great Union. Varying local conditions and requirements may render any universal quarantine code impossible, but on some most important points, all might act in concord. For instance, with regard to cholera, the number of days requisite for Quarantine of Observation after the occurrence of the last case amongst passengers or on a vessel, and also the most efficient germicide for the disinfection of the baggage, cargo, etc., are matters in which similar action might well obtain at every port along the seaboard, from your most southern to our most northern one. This is a subject in which every State and every Province, aye, and every individual on this great Continent, is interested. If cholera once make its entry anywhere on this Continent, it will be hard indeed to stop its inland progress and its diffusion far and wide. The maritime quarantine stations of both countries may be compared to one great chain, and I need hardly remind you of the old adage that the strength of a chain is that only of its weakest link. But, in hope at least, we may go farther yet, and in addition to concerted action on this side, strive for something more. And I would wish to be allowed to add my tribute of testimony as to the desirability and expediency of International Quarantine. Such help to us always has been important. Even in the days of sailing vessels as passenger carriers it would have tended to prevent, or much lessen, the arrival of infectious sickness at our ports. But with those vessels, after their long voyages, we at least knew the worst when they arrived. Now, with the introduction of steam ships, which make the passage from Europe in less than a week, there is always the possibility of passengers contracting disease just before sailing, and arriving here before the period of incubation has elapsed, and so being able to pass undetected the most careful and vigorous quarantine inspection. This might happen but rarely, but the very fact of there being such a possibility, shows how important the careful supervision of passengers before they sail would be, where this is possible. And at least, in addition to the inspection on embarking, some endeavor should be made to secure from the authorities of the districts whence the passengers come, information of the conditions as to any existing infectious disease in those districts. Such facts when so ascertained, could be cabled, by code words, in warning to the quarantine officers of the port to which the vessel is consigned. Vessels are making shorter and shorter voyages now, and it seems of ever increasing importance to strive for this much at least, even if no more can yet be obtained, in the way of international notification of the existence of infectious disease."—F. MONTIZAMBERT, M. D., Chief Quarantine Officer of the Dominion of Canada.

Montreal.—Dr. La Rocque furnished a very full account of the sanitary features of Montreal, its sewerage, water-supply, mortality and the preventive measures to be adopted against contagious diseases, especially in the event of a visit from cholera. "The Board of Health has decided to take measures to prevent the spread of contagious diseases. I have prepared a circular to be addressed to the medical men of the city and surrounding municipalities, to the superintendents of schools, workshops and manufactories, and heads of other large establishments, asking them to report any case of contagious disease that might come under their notice. A circular will be sent to families wherein such cases exist, giving them full instructions for the isolation of patients, the use of disinfectants, and anything else calculated to prevent the spread of the disease. The surrounding municipalities, having no drainage, no system of scavenging, in fact having done nothing towards sanitary improvements, are more or less in a fit state to favor contagious diseases, especially cholera. They will be invited to join the health authorities of this city to adopt the necessary preventive measures against this disease."—A. B. LA ROCQUE, M. D., Medical Health Officer.

Toronto.—Closing a general sanitary description of the city, Dr. William Canniff, the health officer, added: "While the present sanitary condition of Toronto is not all I would wish it to be, I am able to say that very great improvements have been effected, and that this advancement will in the future be more marked. I can affirm that the city I represent will give due heed to any recommendations this Conference may make in relation to municipal hygiene. The fact that I am present here to-day is evidence of the interest which is felt by my city in the subject, to discuss which we have met, and I can safely say that in the event of cholera reaching America, Toronto will be found ready and willing to take any step and to make any expenditure necessary to prevent and combat the disease."

COMMITTEES.

Early in the meeting, committees were appointed: on Federal Legislation, on State Action, and on Municipal Hygiene.

A number of papers, resolutions, etc., read or presented to the Conference, were referred to the above-mentioned committees. Among them was a resolution, by myself, which was as follows:

Resolved, That a prudent regard for the probable danger of the introduction of cholera at localities where the local authorities are unable to battle with it successfully, suggests the propriety of an appropriation, by each State Legislature, of an epidemic contingent fund, to be placed at the disposal of the Governor of the State, to be used under the direction of the State Board of Health, in case of necessity, for preventing the introduction or spread of cholera.

Referred to the Committee on State Action.*

REPORT OF COMMITTEE ON STATE ACTION.

The committee on the action necessary on the part of the State, in order to prepare for the possible advent of cholera, as well as to guard the great interests of public health in general, reported as follows:

The laws under which State boards of health and the municipalities act in the several States are so diverse that it is impossible to formulate any method of uniform action except in a few particulars. It is conceded that the most thorough and scrupulous enforcement of all the details of cleanliness as to all persons and all surroundings is the basis of the preparations to be made by States and by individuals. Coequal in importance with this is the provision of methods by which to keep a disease from being brought into any State. This necessarily divides itself into that which relates to maritime commerce and to commerce between one State and another.

As at present our dependence for the former protection is chiefly that furnished by the State authorities, it can only be claimed that each State should be made fully aware of what protection is afforded by the ports through which such commerce and travel pass on approach to their own borders, and should be careful to add such additional details of examination as they may deem necessary.

In reference to interstate communication, it is essential that officers of State and municipal boards in adjacent States should fully notify each other if any case of cholera occurs in its own domain, and give such other information as may be precautionary. It is essential that each local board should in advance determine with precision what it will do with any first cases that occur, and so provide as to isolation, hospitals, refuge stations, furnishing medicine, etc., as that valuable time shall not be lost and that the cholera gain no foothold.

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* The Legislature of Michigan has since passed such a law. It is printed on a subsequent page of this Report, in the article entitled State Health Inspection of Travel.

In our judgment the time has come when the State boards of health of those States that have such organization, and the chief municipal health boards of those States having no State boards, should be recognized in some National form, as having authority to inculcate such sanitary measures—National, international, maritime, and interstate—as are necessary, and to be able to secure the same through those departments of the general government under which they should naturally fall.

Resolved, That in order to secure efficient local boards in States, and the coöperation of the various States, State boards of health should be promptly organized in all the States not yet having such boards.

Resolved, That in addition to the usual appropriations needed for the continuous work of State boards, that State, municipal, and local boards should have contingent appropriations for the exigencies of cholera epidemics.

Ezra M. Hunt, M. D., chairman; I. A. Watson, M. D., J. C. Hearne, M. D., C. N. Hewitt, M. D., G. B. Thornton, M. D., committee.

Adopted.

REPORT OF COMMITTEE ON MUNICIPAL ACTION.

The committee on municipal action, to which had been referred the propositions submitted by Dr. Raymond, of Brooklyn, reported them back, with amendments, and the following eleven propositions were unanimously adopted by the Conference:

First.—That all surface wells should be closed at the earliest possible moment, and that great care should be taken that the water-supply of all cities, towns, and villages should be of undoubted purity.

Second.—That all privy-vaults should be abolished wherever water-closets can be supplied, and that wherever the existence of such vaults is necessary that they should be rendered water-tight in such a manner as to prevent the saturation, not only of the ground surrounding them, but also of the materials of which they are built, and that the contents of such vaults should be kept constantly disinfected, and removed to a proper place at frequent intervals.

Third.—That all stagnant ponds, when practicable, should be disinfected, and when possible the water removed by drainage or pumping, and the further accumulation prevented by filling with fresh earth, or other material free from garbage or other filth.

Fourth.—That great care should be exercised to keep at all times clear and free from obstruction all sewers into which passes the refuse from dwellings, factories and other buildings, and that such examinations should be made as will detect imperfect plumbing in all buildings and the defects immediately corrected. In this connection special attention is directed to the necessity for the thorough ventilation of all soil and waste-pipes, and to the dangers connected with untrapped and unflushed soilwaste and overflow-pipes.

Fifth.—That extraordinary care should be exercised in reference to all tenement houses, lodging houses, and in general, all places where large numbers of human beings congregate, that no accumulation of garbage or other filth be permitted in cellars or yards, and that frequent and thorough cleaning and whitewashing of such structures be required; and that householders should frequently and thoroughly examine their yards, cellars, closets and other out of the way places, to see that no filth of any kind has been deposited there.

Sixth.—That the food supply be vigorously watched to exclude from the market all unwholesome meat; all milk adulterated or from diseased animals; and all unripe fruits and vegetables; and that cow-stables be kept, at all times, clean, well whitewashed and free from all excremental accumulations.

Seventh.—That all garbage, kitchen and household refuse should be promptly removed from dwellings, stores and other buildings to a proper place, where it may be destroyed by fire or otherwise disposed of in such manner as to occasion no nuisance.

Eighth.—That such material should never be used in the filling of lots or disposed of by throwing the same in streets or vacant property where it may decompose and exhale offensive deleterious gases.

Ninth.—That the attention of the authorities of all institutions, both public and private, and of individuals as well, be drawn to the great importance of maintaining a habit of personal cleanliness in the persons under their charge, as being one of the most efficient means of warding off an attack of cholera, or if it has once appeared of greatly reducing its virulence and fatality.

Tenth.—Should the cholera appear in any place in this country, the health authorities of the place should have immediate notice of the first cases in order that prompt action may be taken for complete isolation and disinfection.

Eleventh.—That all authorities of States, cities or villages be urged to adopt measures which will result in the amelioration of all conditions such as have been referred to in the foregoing propositions with the warning that, in the opinion of this Conference, such conditions, if permitted to continue, will greatly promote the spread of cholera when it comes, and with the assurance that, if requisite measures are promptly taken to remove them, the disease will be less likely to attack a community so prepared, and if attacked, such a community will be better able to cope with the disease and to reduce its ravages to a minimum.

J. H. Raymond, chairman; F. Montizambert, W. L. Breyfogle, S. H. Durgin, C. W. Rowland, J. T. McFarland, Joseph Spiegelhalter, committee.

REPORT OF THE COMMITTEE ON NATIONAL ACTION.

The members of the Committee on National Action, as first constituted, were as follows: Drs. Walcott, of Massachusetts; Smith, of New York; Rauch, of Illinois; Herrick, of Louisiana; Baker, of Michigan; Hon. Erastus Brooks, of New York, and Dr. McCormack, of Kentucky. There were afterwards added to the committee, Drs. Hearne, of Missouri; Wood, of North Carolina; Chancellor, of Maryland; Elder, of Indiana; Thornton, of Tennessee, and Coverton, of Canada. The committee reported a bill, which was afterwards presented to the public-health committee of the U. S. House of Representatives, providing for a National Board of Health to consist of one member from each State Board of Health. Congress having failed to make appropriations for the support of the present National Board of Health, it was argued that perhaps Congress would have more confidence in a National Board constituted in the manner proposed in the new bill. But no action by Congress has resulted.

THE PRESIDENT'S INTEREST IN PUBLIC HEALTH.

As showing the interest taken by the President of the United States, and members of his cabinet, in the work of the Conference, the following quotations from the report of the Secretary of the Conference, may be useful:

"During the recess the members proceeded in a body to the Department of State, in response to an invitation from Secretary Frelinghuysen, to whom the delegates were severally introduced by Medical Director Gihon, U. S. N. Accompanied by the Secretary the members proceeded to the White House, at the request of President Arthur. Secretary Frelinghuysen presented the members to the President, and the purpose of the visit to Washington was stated in a brief address by Mr. Brooks, who explained that the object of this meeting of the Conference was to consider methods for preventing the importation of Asiatic cholera into and preventing its spread in this country, and that the gentlemen composing this body were practical sanitarians, representing the existing health organizations in twenty-four States of the Union, with four delegates from the Dominion of Canada. As soon as they had sufficiently considered them they would present their views to Congress, asking such legislation as seemed to be demanded by the exigencies of the times, and expressed the hope that the President would favor the purposes they had in view.

"Both President Arthur and Secretary Frelinghuysen responded in cordial words of welcome and interest in the objects of the Conference, and promised every assistance in their power in aid of the movement. The President said that the State and Treasury departments were just now engaged in preparing new rules regulating the importation of rags from foreign countries, so as to reduce to a minimum the danger of bringing cholera and other contagious and infectious diseases to our shores through this article of commerce, and would be glad to have all the information they could obtain on the subject. He suggested that the Conference appoint a committee to advise with the Secretaries of these departments in regard to this matter, which he was informed would be done.

"At the close of this interview an invitation was received from the Secretary of State and from Secretary McCulloch, of the Treasury department, for a business presence and discussion as to proposed measures of legislation and the work needed from Congress and from the Executive to prevent the introduction of cholera into the United States, and the best methods of meeting the scourge if it should force its way into the country.

"The Secretary of the Treasury invited the committee on Federal Action to meet him at his office in the Treasury building, and the Secretary of State at his rooms in the State department. Secretary McCulloch expressed the deepest interest in the subject of imported rags in connection with quarantine laws and regulations; upon the proper disinfection of old rags when coming from infected ports or places, and upon proper officers and proper times and places for disinfection and examination."

IMPORTED RAGS AS A DANGER TO PUBLIC HEALTH.

At the close of the interview with the Secretary of the Treasury, the Secretary requested that a communication should be made to him by the committee on National Action, expressing the views of the committee on the subject of the danger from imported rags. As one of a sub-committee to frame memoranda for said communication, the part which I submitted is the last half of the first paragraph in the following, commencing with "Members of this committee believe that contagious diseases dangerous to the public health occur in the homes of the people in every country." The entire communication was as follows:

WASHINGTON, D. C., *December 11, 1884.*

To the Honorable Hugh McCulloch, Secretary of the Treasury:

SIR,—The committee appointed by the Conference of State Boards of Health to consider the subject of National action relating to health, which committee had the honor of an interview with you this day, hereby respectfully submits the view of the committee respecting the particular source of danger to health upon which you have expressed a wish to receive the opinion of the committee, namely, from imported rags. Members of this committee believe that contagious diseases dangerous to the public health occur in the homes of the people in every country; that old rags are collected mainly from cast-off material from the homes of the people, and that old rags, in whatever country collected, are not free from danger, and that it would tend to prevent the introduction into this country of more than one contagious disease if all old rags imported into the country should be disinfected before or on entrance at the port of entry.

This committee are of the opinion that disinfection of old rags can be effected by boiling them thoroughly, by exposing them to superheated steam so as to assure a temperature equal to or exceeding 212 degrees, by the use of sulphurous acid gas—the rags being fully exposed to the action of such gas in the ratio resulting from the burning of two pounds of sulphur to each 1,000 cubic feet of air, or by the use of sulphurous acid in any other form or manner which shall secure the subjection of the rags to that agent in an effectual manner.

This committee further express the opinion that the disinfection of rags should be allowed to be effected in any country when a proper inspection of the process of disinfection can be secured, and such disinfection certified to by a representative of the United States.

Very respectfully yours,
H. P. WALCOTT, *Chairman.*
S. S. HERRICK, *Secretary.*

CONSTITUTION AND BY-LAWS OF THE CONFERENCE.

These are so brief and useful, and hamper the association so little, that I give the whole as follows:

Resolved, That there shall be a National Conference of executive officers and other representatives of State boards of health, during the meetings of the American Public Health Association, and at other times and places if so desired. All questions shall be determined by votes by States, each State being entitled to one vote. The officers shall be a chairman and secretary.

The foregoing report of my attendance at meetings of the Conference of State boards of health, is respectfully submitted.

HENRY B. BAKER.

TESTING ILLUMINATING OIL IN MICHIGAN.

REPORT BY THE SECRETARY OF THE STATE BOARD OF HEALTH.

At the meeting of the State Board of Health, April 14, 1885, the Secretary presented and read a report of his attendance, by invitation, at a meeting, March 13, 1885, of the State Inspector of Illuminating Oils with his deputies. The Board ordered the report to be printed, with the additional statement that there are not sufficient data to warrant the lowering of the test now required in Michigan for illuminating oils. This action was taken in view of the measure pending in the State legislature for the reduction of the test. The following is the Secretary's report:

STATE OIL INSPECTORS IN COUNCIL.

A meeting of the State Oil Inspector and his deputies was held in the "Pioneer" room at the State capitol, Thursday, March 13, 1885, for the purpose of comparison of methods of testing illuminating oil, questions and rulings by the chief Inspector, and for the general perfection of the service in the interests of safety to life and property.

The first act was the actual inspection of a sample of oil procured from a respectable dealer in Lansing. On invitation of Hon. S. W. La Du, I was present and made this inspection, using for this purpose the original instrument adopted by the Board, and such as is required by the law. The methods of testing were carefully watched by the several deputies, and points of differences were commented upon and explained. The oil flashed at 120° F., and I insisted that the oil should be branded as rejected. Discussion followed, which revealed the fact that the law has sometimes been construed as permitting the use of oil that flashed at 120° F. I stated that the law plainly said that such oil must be rejected, and claimed that it was all wrong for oil inspectors to allow the manufacturers or dealers to crowd down the quality of the oil so close to what the law considers the danger line, when it is well known that good oil has been supplied which would not flash at a temperature lower than 140° F., or even 150° F., and that the oil which I use does not flash at a temperature less than 240° or 260° F. It was simply placing a question of a few cents in money against a question of safety to life and property.

I also said: It has been customary for some deputy oil inspectors to apply the test to five or six barrels of oil, and if no "combustible vapor" was given off at a temperature of 120° F., to approve and brand forty or more other barrels in the same lot. In this way oil far below the test might be approved, and any man guilty of this practice ought to go to State's prison. Still more dangerous than this is the practice of taking a small quantity from each barrel and then testing this mixture. One barrel might give off a combustible vapor above and another below 120° F. An average would be tested; all would be approved; and the barrel of dangerous oil would be sold which might destroy a human life. I was asked in regard to the examining of oil in a tank; and replied that in such cases the sample to be examined should be taken from the top, and never should all barrels filled from a tank be branded approved when the test has only been applied to oil drawn from the bottom of the tank, where the oil was liable to be heavier.

If oil flashed once at a temperature of 120° F. and failed to do so at many other trials, the one case of positive evidence was worth more than the dozen cases of negative testimony which only showed that the conditions for a flash were not secured. The conditions might be unfavorable, as in a close room where there was so small a supply of oxygen that it would be impossible to secure a "flash." On the other hand circumstances could not be too favorable. *The oil had once flashed* at 120° F. The oil was illegal and should be condemned. In all cases the people should be given the benefit of a doubt. Other interesting topics were discussed by the inspectors present.

At the afternoon meeting, the sample of oil which I had tested was tested by a deputy inspector and found by him to flash at 123° F. Another deputy then found it to flash at 120° F. Different thermometers had been used by each person. I then exhibited a standard thermometer, and several deputies compared their thermometers therewith, with the result that scarcely two were exactly alike.

At the morning session I read a paper as follows:

To the Oil Inspectors of Michigan:—

About the time the Michigan State Board of Health was established, the Legislature passed a law providing for a much higher test for illuminating oil than it had formerly established, but that law allowed the inspections to be made in other States than Michigan. For this, and other reasons, the State Board of Health then found that among the dangers to life and public welfare, kerosene oil still held a somewhat prominent place. During the first few years of the existence of the Board, much thought and labor were devoted to this subject, some record of which may be found in the annual reports of the Board. In order that each of you may have, in a convenient form, an outline of what has been done by the Legislature, and by the State Board of Health, for the protection of life from dangerous illuminating oils, I have collected a sufficient number of pamphlets on this subject so that I can give to each deputy inspector in Michigan a set of documents which, if he will study them, will enable him to have a good thorough knowledge of the past experience on this subject in this State, and a knowledge of some of the causes of lamp explosions which ought to be widely known. I refer more particularly to the fact that the brass collar and wick-tube are the parts of the lamp which usually become most heated, and that the explosive vapor is thus formed by the mixture of the vapor of oil given off by the wick-tube, with the air in the lamp, the mixture of about three parts of vapor of oil with five parts of air being explosive; also to the fact that there is a very great increase of the danger of an explosion of a lamp soon after the chimney of the lamp has been broken or otherwise removed.

The apparatus for testing illuminating oils has all been planned so as to heat the oil from the bottom, yet I believe my experiments long ago proved that the vaporizing of the oil most usually occurs from those parts of the lamp through which the wick passes. Although this is true, it is also true that the temperature of the oil in the lamp may have much influence in controlling the conditions favorable or unfavorable to explosion, because when the oil is cold, vapor formed at the upper portion of the space in the lamp may be condensed as fast as it falls upon the cold oil below.

The conditions essential to an explosion of vapors from oil being known, the test provided for by the Michigan law is, perhaps, as good as any, so far as relates to the method for ascertaining the temperature at which the oil gives off a "combustible vapor." I think it is true, however, that with oil that does not flash at a temperature below 120° F., which is about as high as the oil usually gets in lamps, the comparative safety of a sample of oil does not so much depend upon the temperature at which that oil gives off a "combustible vapor," as upon the temperature which that particular oil when burning in a lamp causes the wick-tube to reach; and this temperature depends very much upon how much paraffine and tarry matter there is in the oil.

Experience in Michigan during the past two years seems to show that the oil usually supplied by dealers does not contain sufficient paraffine to be very dangerous; yet, if the law required such a chill test as would exclude all oil not as free from paraffine as is that known as "water-white" oil, it is very probable that the people would be better satisfied with the light given by the oil, and it would also be safer. Of course it might cost a few cents more per gallon. As there is no legal restriction in this State, I suppose the manufacturers could, if they found it for their interest to do so, supply oil that will pass our State test and yet be very unsatisfactory as an illuminator, and at the same time not very safe to use. However, this is a branch of the subject more profitably considered by the Legislature than by inspectors of oils. As inspectors, under the present law, we have to ascertain whether at the temperature of 120° F. the oil gives off a "combustible vapor." This must be determined by the use of the tester adopted by the Michigan State Board of Health. This is what is called a closed tester, in which the oil is under conditions similar to those in an ordinary lamp. In order that the vapor of the oil shall burn, it is essential that oxygen, or air containing oxygen, shall be present; if the air is displaced by carbonic acid, and no free oxygen is present, the vapor of oil will not burn; therefore, if we have just exploded the vapor in a tester, or in a lamp, we must either pump out the products of combustion, or wait until they have diffused and air is again present, before we can again get a flash. For a similar reason it is not proper to use as a torch to ignite the vapor of oil any substance that will leave in the vapor-chamber a gas, which will in great degree prevent the flashing of the vapor. The old law in Michigan used to require a lighted match. I do not know what has been the custom recently, but a piece of paper twine of uniform size, and which burns steadily and has not too long a coal on the end, is a very convenient article with which to ignite the vapor. An ordinary wooden tooth-pick is still better. In the Michigan tester the lighter is usually introduced from time to time. I think it probable that one reason why the "Foster cup," which is used in Ohio, gives results said to be more favorable to the oil (not favorable to the people who use the oil) is that in that tester the lighter is kept in place all the time, and the products of its combustion must tend slightly toward preventing the rapid combustion of the vapor of oil when it is first given off. That tester is also less reliable in other ways than is the Michigan tester.

The New York State Board of Health tester is substantially the same as the Michigan tester. It has a glass cover for the vapor chamber, and on that account the flash is more easily seen than in the Michigan tester.

At the meeting of inspectors, I exhibited the New York State Board of Health oil tester, and asked for opinions by the several inspectors. The general opinion seemed to be that it was no better than the Michigan State Board of Health tester, and not nearly as convenient for inspectors to carry about with them. Many of them expressed a decided preference for the Michigan tester.

HENRY B. BAKER.

LAWS OF MICHIGAN, PASSED IN 1885, RELATING TO PUBLIC HEALTH AND SAFETY.

The following are the titles of acts, passed by the Michigan legislature in 1885, that have bearing upon public health and safety:

No. 19. An act to require the use of bells on either a team or sleigh during the winter season, for the safety of foot travelers.

No. 27. An act to regulate the sale of adulterated honey.

No. 39. An act to regulate the employment of children, young persons, and women, in certain cases.

No. 78. An act to amend section six of chapter forty-six of the compiled laws of eighteen hundred and seventy-one, being compiler's section sixteen hundred thirty-eight of Howell's Annotated Statutes of Michigan for eighteen hundred eighty-two, relative to burial grounds.

No. 126. An act making it a felony to manufacture, buy, sell, furnish, or cause to be furnished, or have in possession any nitro-glycerine, dynamite, giant powder, or any other dangerous explosive material for unlawful purposes, and to provide a punishment for the same.

No. 132. An act to amend section eighteen of chapter two hundred and sixty-six of the compiled laws of eighteen hundred and seventy-one, being section ninety-six hundred and fifty-one of Howell's Statutes, relative to the inspection of county jails and the regulation thereof.

No. 134. An act to regulate the practice of pharmacy in the State of Michigan.

No. 137. An act making ten hours a legal day's work.

No. 138. An act to prevent the sale or otherwise disposing of obscene, immoral, and indecent books, pamphlets, papers, prints, pictures, writings, and other objectionable news.

No. 147. An act to provide for the introduction and use on all cars owned and operated by any railroad company or other corporation doing business in this State, of some form of automatic car coupling, by means of which all cars may be coupled and uncoupled without the necessity of the brakeman or any other person passing between the cars.

No. 156. An act to prevent accidents by line shafting used on fair grounds or other public places where machinery is running on exhibition.

No. 182. An act to provide for the appointment of a State Live Stock Sanitary Commission and a State Veterinarian, and to prescribe their powers and duties, and to prevent and suppress contagious and infectious diseases among the live stock of the State.

As act No. 182 does not apply to horses or sheep, it will probably not greatly relieve this Board of responsibility of oversight with reference to glanders and other dangerous contagious diseases of animals.

No. 186. An act to prevent deception in the manufacture and sale of dairy products and to preserve the public health.

Act No. 186 has been declared unconstitutional by the Supreme Court of Michigan.

No. 188. An act to provide for enclosing, filling, or fencing of any shaft, pit hole, or trench on any uninclosed or unoccupied lands within this State.

No. 198. An act to regulate and provide for the carrying, yarding and feeding of so-called Texas cattle while in transit into or across this State between the first day of April and the first day of November of each year.

No. 230. An act to provide for the prevention of the introduction and spread of cholera and other dangerous communicable diseases.

Act No. 230 is printed on a subsequent page of this Report; and the action taken by this Board under it is told in the article, which is entitled "State Health Inspection of Travel."

EXAMINATION OF THE STATE HOUSE OF CORRECTION AND REFORMATORY AT IONIA, MICHIGAN.

REPORT OF THE SPECIAL COMMITTEE APPOINTED BY THE STATE BOARD OF HEALTH AT THE REQUEST OF THE STATE BOARD OF CORRECTIONS AND CHARITIES. REPORT MADE JANUARY 13, 1885.

To the Members of the State Board of Health:

GENTLEMEN:—In compliance with a request from the Board of Corrections and Charities, and a resolution of this Board, your committee made an examination of the State House of Correction and Reformatory at Ionia, on the 20th day of November, 1884, with a view to its sanitary condition and requirements. The committee would probably be stating nearly or quite the exact truth, if they said they found the sewerage, plumbing and ventilation, in every part of all the buildings, in the worst possible condition. But to be more specific, the committee first examined the sewer leading from that part of the building where the offices are situated. The primary defect of this sewer seems to be, that it empties itself at the wrong end,—that is, into the basement instead of into the catch-basin near the barn. The theory of the present engineer and warden is, that the whole of that portion of the building has settled and carried down with it the house end of the sewer, until it is several inches lower in the basement than it is a few feet from the house. This sewer is of six-inch tile, very tortuous in its course for about one hundred and fifty feet, where it connects with the main sewer. There is no flush tank, or any provision for flushing it except with hose attached to the hydrant in the yard. There is little or nothing to prevent garbage and refuse of any kind being thrown into the sinks in the kitchen and wash rooms and into the water closets, and from thence carried through the waste pipes into the sewer. From this cause, and from another probable cause, that a portion of the sewer in the yard near the house is higher than at its commencement in the basement, the sewer has become filled up. A new sewer should be laid, leading from the basement of the office building to the main sewer. The engineer says there is ample fall between the basement and the point where this lateral connects with the main sewer. The plumbing connecting the kitchen, wash-room, bath-room and water-closets with this sewer is in wretched condition, and should be replaced with new, with properly-ventilated soil-pipes, and approved traps. The floor in the large bath-room for the use of convicts, is of brick, hummocky and without proper incline to allow the water to drain off at the center. This should be relaid with hard wood or concrete, with sufficient incline towards the center to allow the water to drain off quickly and afford an opportunity for the room to become dry in a short time after being used.

Of the ventilation or rather the want of it in all the buildings comprised in this institution, it is difficult to speak with any degree of composure. There is an attempt to ventilate the cells by means of a shaft leading from each to the top of the second tier of cells, where it connects with a horizontal shaft running along on top of the brick work. This shaft is supposed to open somewhere, but just where your committee was unable to ascertain. Each upright shaft is made to do duty for two cells, one above the other, but none of them are heated, nor is the horizontal shaft into which they open. There is an opening into these shafts at the bottom of each cell large enough to receive the night-bucket. Your committee considers this arrangement an admirable one for the equal distribution of poisonous gases through all the cells, but can hardly call it ventilation. In the shoe shops your committee found that an attempt had been made to carry out the recommendations of a former committee of this Board, by placing steam coils in the few shafts put in when the shops were built. But these coils were not heated in the least, and the committee were unable to learn that they ever had been. Of course they were of no possible aid to ventilation. In the other shops not the least attempt to ventilate them has ever been made.

In the cigar shop the odor of tobacco and foul air was simply intolerable. In this shop some seventy-five or one hundred persons are employed, mostly young men and boys, and your committee could hardly fail to note the pallid faces of nearly all of them, and to feel that it is little less than barbarous to confine young men for eight or ten hours a day in such a foul atmosphere. In no part of any of the buildings connected with this institution is ventilation perfect, and in most parts there is none, and your committee fully agrees with the suggestion contained in the late message of Gov. Alger that this "institution needs a thorough overhauling." The water-closets for the accommodation of the shops occupy a space at the end of each, generally just in rear of the overseer's stand. A simple board partition on three sides separates them from the main portion of the halls. The plumbing in all of them is defective, and they are unventilated, permitting the foul odors arising from them to be distributed through that portion of the shops where they are situated, and rendering the overseer's position a very disagreeable, if not a dangerous one, and also contaminating the atmosphere of the whole shops. In the opinion of your committee these closets should be removed outside of the walls of the shops.

In the room designed for a hospital, and under construction at the time of the visit of your committee, a ventilating flue is provided for each room. These flues are supposed to open into the attic. Your committee could not learn that any provision for heating them had been made, or that any was intended. These flues should be grouped, carried out through the roof and heated. To make the repairs necessary to insure thorough ventilation of the buildings of this institution, to repair or replace the plumbing, and to relay the sewer, will require the expenditure of a considerable sum of money, an appropriation for which the present Legislature should not fail to make. Your committee would recommend that a competent architect be employed to make plans and specifications, and to superintend the details of the work. All of which is respectfully submitted.

JNO. AVERY,
C. V. TYLER,
Committee.

EXAMINATIONS OF PLANS FOR PUBLIC BUILDINGS.—YEAR ENDING SEPTEMBER 30, 1885.

REPORT BY THE SECRETARY OF THE STATE BOARD OF HEALTH.

Section 7 of act 206 of 1881 (§ 418 Howell's Annotated Statutes) requires boards of State charitable, penal, or reformatory institutions before adopting plans of buildings for school purposes, living-rooms, work-rooms, or sleeping-rooms for inmates, or for any system of sewerage, ventilation, or heating, authorized by the Legislature to be constructed, to submit such plans to the State Board of Corrections and Charities and to the State Board of Health for examination and opinion thereon; and the State Board of Health is required to visit such institutions when necessary to make the examination required by the law. On pages 339–343 of the report of this Board for 1882 is a copy of the law and a report of the examinations by this Board during the fiscal year 1882; and on pages 29 and 117–120 of the Report for 1883, and on pages 33–36 of the Report for 1884, are similar reports.

NORTHERN ASYLUM FOR THE INSANE.

May 7, 1885, the following letter was received from the Superintendent of the Asylum for the Insane at Traverse City:

NORTHERN ASYLUM FOR THE INSANE,
Traverse City, Mich., May 5, 1885.

Henry B. Baker, Secretary State Board of Health, Lansing, Mich.:

SIR:—At a meeting of the Board of Commissioners of the Northern Asylum held in Lansing, April 29, 1885, I was instructed to invite the State Board of Health and the Board of Corrections and Charities to meet with the Board of Commissioners, at Traverse City, at 9 A. M., Wednesday, June 3, 1885, for the purpose of examining the Asylum plans for heating, plumbing and sewerage, as required by law.

The late date is necessitated both by the absence in New Orleans of your Board, and your desire expressed to me through the Secretary of the Board of Corrections and Charities for a long notice.

Hoping for a full attendance on the part of your Board, I remain, yours very truly,

C. M. WELLS, Supt. and Sec'y.

In accordance with this request, a meeting of the State Board of Health at Traverse City at 9 A. M., June 3, 1885, was called by the President, to examine plans for the heating, plumbing and sewerage of the Northern Asylum for the Insane, and for the transaction of such other business as might properly come before the Board at that time.

In pursuance of the above invitation, and the call of its President, the State Board of Health met at Traverse City, June 3, and examined the

Asylum building, grounds, and surroundings, and the plans for heating and plumbing. No detailed plan for the sewerage was presented.

All the members of the Board of Commissioners of the Asylum were present, and through their kindness and that of the superintendent, Mr. C. M. Wells, the inspection by this Board was courteously facilitated.

The following are the suggestions by the State Board of Health:

GENERAL SUGGESTIONS.

The building is upon high, gravelly ground, and the natural drainage of the site would seem to be good. This same porosity of the earth down to the ground-water, which is said to be about thirty or forty feet under the sand and gravel, renders it of extremely great consequence that so long as the water for use in the asylum shall be taken from the earth or from springs from the earth, the porous water-shed in the rear of and in the vicinity of the asylum be faithfully guarded from causes of sickness, such as privies or contamination by leaching of sewage; because the cause of typhoid fever might easily pass down through such a soil. No detailed plan for water-supply was formally presented to this Board for approval, yet informally the subject was mentioned, and the foregoing suggestion is respectfully offered, as also that the sewage be conveyed in a water-tight conduit to the Boardman river.

THE CHAPEL BUILDING.

According to the plans and specifications, the fresh-air inlets of the chapel building are to consist of eight openings each 6x12 inches, cut through the outside wall, and diminished by a register on the inside, so that the opening is about 4x12. The heating coil is to be placed just over the inner opening. The foul air is to be removed:

1. By two ventilating shafts, each with a sectional area of two square feet, placed on either side of the stage, with an opening into each placed two feet above the floor.
2. By a round opening in the ceiling three feet in diameter, with a garret over it, and an opening of about the same capacity communicating with the open air through the roof.

The aggregate sectional area of the fresh-air inlets is about two and two-thirds feet. Estimating the velocity of the incoming air at ten feet per second, a velocity not usually attained without artificial means for producing a draft, the air supply would be sufficient for scarcely fifty persons, calculating two thousand feet for each person, which is certainly a very moderate estimate for persons in health, and rather too small an estimate for the class of persons usually found in an insane asylum. The capacity of the room being 300, it is evident that a larger provision for fresh air should be made. This may be very easily accomplished by running two lateral ducts from the pipe shaft which passes beneath the chapel building, and which, as suggested by the superintendent, may be used as a fresh-air duct. It is suggested that the openings of these ducts be on either side of the entrance to the chapel room, and that each opening should have a sectional area of not less than six square feet. The method of removing the air seems to us objectionable in the following particulars:

1. The opening in the ceiling will remove the warm, fresh air, which passes at once to the ceiling as soon as it enters the room, and in doing so will be likely to antagonize the other two ventilating shafts.

2. The opening into the ventilating shafts should be at the floor instead of two feet above it.

3. If the opening in the ceiling is closed, which we would recommend, and which we think will be found necessary in order to heat the building, much larger provision for the removal of foul air will be required.

We would suggest the addition of a shaft having a sectional area of not less than twelve square feet, to be placed back of the stage and communicating with the chapel room by a long register of equal capacity, placed at the floor in the front of the stage. A steam coil of sufficient size to insure constant draft should be placed in the bottom of this shaft.

The aggregate amount of heating surface for the chapel room, as shown by the plans, is 700 square feet. While this is ample according to the usual rules for estimating employed by steam-fitters, who calculate the amount of heating surface according to the amount of space to be heated, it will be quite insufficient to heat the *quantity* of air which will be furnished, provided the suggestions made respecting the ventilation are adopted. It is recommended that a coil, containing not less than 250 feet of heating surface (indirect) be placed at each of the fresh-air openings suggested above.

VENTILATION OF MAIN BUILDING.

In the main building the foul air is collected from the vertical ducts by horizontal trunks along the floor of the garret and communicating at various central points with openings through the roof. This arrangement is perhaps in some respects an improvement over that shown by the plans when first examined by the Board, and under favorable circumstances, will probably secure efficient ventilation, but is certainly more liable to serious and harmful interference from the opening of windows in rooms of different stories, than the plan suggested by members of the Board at the previous meeting, which would secure a separate ventilating duct for each room.

It is evident that the greatest possible degree of isolation of individual rooms as regards air supply in an institution of this sort is highly desirable. If many rooms communicate with a common chamber in the garret, the opening of a window under certain circumstances or conditions of the wind would expose the inmate of the room to foul or contaminated air, and thus act as an efficient means of spreading infectious diseases.

In some parts of the building the horizontal trunks are so crooked, in some instances turning four or five square corners, that the draft in the portions most remote from the ventilators must be very greatly diminished, and as the system of heating employed is wholly "indirect," and hence dependent upon ventilation for equable distribution, it is evident that those portions of the building most remote from the ventilators will be insufficiently heated as well as poorly ventilated. It is feared that this difficulty will be experienced in parts of the building, and especially in the portion known as "B transverse," and the corresponding one known as "2 south," in each of which a change in position of the ventilator as first designed has necessitated such a degree of crookedness of the horizontal trunk that it seems highly necessary that an additional ventilator should be constructed in the rear of the one now existing.

THE VENTILATION OF WATER-CLOSETS.

As shown by the plans, the ventilating ducts from the water-closets lead to the common collecting trunks, and in some instances at points so remote from the ventilator which leads through the roof as to make the draft very defective, and render contamination of the air of portions of the building with air from the water-closets, not only possible but probable. Each water-closet should be supplied with a separate ventilating duct, not less than 8x8 inches in size, and should be independent and constantly heated to secure a good and permanent draft. The opening of this duct should be just above the closet bowl, and on the same side of the room instead of on the opposite side, as shown in the plans.

On the whole the plans show great care on the part of the architect and superintendent as regards sanitary matters, and are worthy of high commendation.

REFORM SCHOOL AT LANSING.

Shortly before the special meeting of this Board at Traverse City, June 3, 1885, there were left at the office of the Board at Lansing, by a messenger from Hon. C. A. Gower, Superintendent of the State Reform School, four drawings of a new building which it was said it was proposed to erect on the grounds of that institution. Those drawings exhibited:—

1. Side elevation.
2. End elevation.
3. Floor plan—1st story.
4. Floor plan—2d story.

A verbal statement was made by the messenger that each room would be heated separately, partly by direct radiation, and partly by hot air. The plans submitted showed no details of heating, ventilation, house-drainage, or other sanitary requirement.

These plans were submitted to the Board at its meeting in Traverse City, June 3, 1885, but they were found to be insufficient for the purposes of the Board in arriving at a decision, from a sanitary point of view, as to the fitness or unfitness of the proposed building for the purposes for which it is designed.

On June 8, the plans were handed to the same person who brought them, to whom it was stated that this Board would meet in Lansing, July 14, 1885.

MICHIGAN ASYLUM FOR THE INSANE AT KALAMAZOO.

At the special meeting of the State Board of Health, at Traverse City, June 3, 1885, plans for a proposed infirmary for males at the Michigan Asylum for the Insane, at Kalamazoo, were submitted as follows:

1. "Ground plan."
2. "Front elevation."
3. "Longitudinal section."

Also a letter from George C. Palmer, M. D., Superintendent of the Asylum, containing the following additional information:

> "Yours of the 19th inst. is at hand. I have delayed my answer until now, thinking that I might possibly be able to meet you at Traverse City the 3d of June, but I find that it will be impossible for me to do so. The new Infirmary, of which I sent you plans some time since, is modeled very much after the one erected two years since, the provisions made for the ventilating of which you did not approve. I think, however, that you did not take into consideration the great utility of the open fire-grates employed in the Infirmary. There are two in use on each floor, arranged so as to admit a large supply of fresh warm air, at the same time acting as the very best ventilating flues.
>
> "All the single rooms are provided with ventilating flues with iron pipes beginning at the top of the flues in the attic, and extending through the roof, not ventilating into the attic, as in the main building. Not more than three are united into one trunk flue. Nearly the same arrangement will be made in the proposed Infirmary as already exists in the one erected."

The sizes of rooms, numbers of inmates proposed to be accommodated, sizes of inlets for fresh air, of outlets for foul air, of single flues, and of trunk flues, were not given. Nothing was presented with reference to the house-drainage and sewerage.

From the plans submitted, and the description by Doctor Palmer, the members of the State Board of Health were unable to obtain such a clear view of the details of the sanitary arrangements for the proposed infirmary as would warrant an expression of opinion.

The secretary of the State Board of Health was directed to inform the superintendent of the Asylum that the Board would hold its regular meeting at Lansing, July 14, 1886.

DOUBLE COTTAGE AT THE STATE REFORM SCHOOL AT LANSING.

At the meeting of the State Board of Health at Lansing, July 14, 1885, plans for a double cottage at the State Reform School were submitted for examination by this Board, and were explained by William Appleyard, Architect.

Basement.—The floor is to be of concrete, cement finish, troweled smooth. From the the shower-bath the outlet is through a trapped drain, leading to sewer. There are to be no water-closets in the building. The fresh air enters through basement windows, about two feet above ground, and is conveyed through tin-lined boxes to "Gold pin" radiators.

Of the foregoing, this Board approved.

First floor.—The two sides of the building are symmetrical, there being on each side a school-room designed to accommodate fifty pupils, and a smaller room adjacent for the attendant. The small room is to have direct radiation from a steam coil, and a foul-air outlet by means of a fire-place. The area of each school-room is 30 by 40 feet, and 13 feet high (312 cubic feet of air-space to each of 50 inmates). There is to be direct radiation from a steam pipe around the room at about the hight of the window sill. Fresh air is to be supplied to each school-room from radiators in the basement, through two 16 by 24 inch registers, each register having 256 square inches actual opening, the registers set in the floor, near together, the aggregate area of both inlets being 512 square inches.

The foul-air flue is 12 by 24 inches, entered at the floor-level by a single 15 by 25-inch register having actual opening of 256 square inches (only one-half the area of the inlets). The foul-air flues to both school-rooms are to be warmed by contiguity to the furnace smoke-flue.

The State Board of Health respectfully suggests that another foul-air outlet and flue, of a size equal to the present one, be made in the outer wall at the east end of the east school-room, and another at the west end of the west school-room, and that each of these flues shall be heated by steam-pipe. Also, as regards the fresh-air inlets in the floor, this Board recommends that iron register-hoods be put over them so that dust will not so readily settle in them and be mingled with the incoming air which must be breathed by the inmates.

Second Floor.—The hight of rooms on this floor is 12 feet. The size of the small room for the attendant is 12 by 18 feet, in which the fresh air inlet is 8 by 12 inches. The outlet is the same. The size of each dormitory on the second floor is 30 by 40 feet. There are ten windows in each. Each room is to accommodate twenty-five boys. There is no direct radiation, otherwise the heating and ventilating is provided for in the same manner as in the school-room below, the inlets and outlets being the same size as those below. The foul-air flue is warmed by the adjacent smoke-flue.

The plans for this floor were approved.

Third Floor.—The hight of the dormitories on the third floor is eleven feet. Each is to accommodate twenty-five boys. The ventilation and heating are the same as below, except that there is to be a steam pipe in each foul-air flue to promote draft.

The plans for this floor were approved.

THE PREVENTION OF THE INTRODUCTION OF COMMUNICABLE DISEASES.*

CIRCULAR ISSUED BY THE MICHIGAN STATE BOARD OF HEALTH, AUGUST, 1885.

[91.]

To the Officers and Members of Local Boards of Health in Michigan:

GENTLEMEN:—Common observations show, and the records of the office of the State Board of Health prove, that the communicable diseases, such as scarlet fever, diphtheria, small-pox, and whooping-cough, are spread by the movements of the people. Excepting possibly diphtheria, which some physicians think may be originated in this State, these diseases do not originate in any locality in Michigan. Whenever they occur in any place in this State, they are therefore always brought to that place from some other place within or without the State, except in cases where the cause of the disease has been preserved from a previous case through lack of disinfection. The object of this circular is to call the attention of local health authorities to the importance of more thorough measures for preventing the introduction of these diseases into the State, and into each township, city, and village.

The need for more effective work in this direction may be better appreciated by glancing at the disastrous results in the past, and a consideration of the rapidly increasing dangers from communicable diseases, because of the rapidly increasing facilities for travel, and for all kinds of intercommunication between all classes of the people of this country and of foreign countries.

According to reports to the office of the Secretary of State, for the ten years ending with 1882, the average number of deaths per year from several diseases was as follows: Scarlet fever, 444; diphtheria, 892; typhoid fever, 520; small-pox, 53; whooping-cough, 156; measles, 133. Because of defective methods of recording, it is believed that only about one-half of the deaths are reported, so that, multiplying by two the deaths reported, the average numbers of deaths which probably occurred in Michigan from these diseases, per year during the period mentioned, were as follows: Scarlet fever, 888; diphtheria, 1,784; typhoid fever, 1,040; small-pox, 106; whooping-cough, 312; measles, 266.

The number of cases of sickness from scarlet fever in Michigan in the year 1884, reported to the State Board of Health, was about 2,467. The number of cases of diphtheria reported was about 3,915.

These diseases are generally called "*preventable*" diseases because we know how to prevent them, or at least to restrict their spread whenever and wherever all classes of persons will coöperate with the health authorities for that purpose. The State Board of Health has issued documents telling how to restrict several of these diseases. Those documents are useful to local health authorities and to householders. This document is designed to stimulate local *health authorities themselves* to greater activity in efforts to prevent the introduction of these diseases into their jurisdictions.

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* Cholera is a communicable disease, although not considered contagious, that is to say, transmissible by touch. The same may be said of typhoid fever.

The law for the prevention of the introduction of these diseases seems yet, in some respects, to be in advance of the practice in most of the localities in Michigan. Some of the provisions of the law to which your attention is invited, are as follows:

INSPECTION AND RESTRAINT OF TRAVELERS FROM INFECTED DISTRICTS.*

Board may restrain travelers coming from infected districts.

62. (1708.) Sec. 17. The board of health of any township near to or bordering upon either of the neighboring States, may appoint, by writing under their hands, suitable persons to attend any places by which travelers may pass from infected places in other States; and the persons so appointed may examine such passengers as they may suspect of bringing with them any infection which may be dangerous to the public health, and, if need be, may restrain them from traveling until licensed thereto by the board of health of the township to which such persons may come; and any person coming from such infected place, who shall, without license as aforesaid, travel within this State, unless it be to travel by the most direct way to the State from whence he came, after he shall be cautioned to depart by the persons appointed as aforesaid, shall forfeit a sum not exceeding one hundred dollars. —§1649.

WARRANT FOR REMOVAL AND CARE OF INFECTED PERSON.

Removal of persons infected.

63. (1709.) Sec. 18. Any two justices of the peace may, if need be, make out a warrant under their hands, directed to the sheriff or any constable of the county, requiring him, under the direction of the board of health, to remove any person infected with contagious sickness, or to take possession of convenient houses and lodgings, and to provide nurses, attendants, and other necessaries for the accomodation, safety, and relief of the sick.—§1650.

WARRANT FOR DETENTION AND DISINFECTION OF INFECTED BAGGAGE, CLOTHING, OR OTHER GOODS.

Infected baggage, clothing, and goods, how secured.

64. (1710.) Sec. 19. Whenever, on application of the board of health, it shall be made to appear to any justice of the peace that there is just cause to suspect that any baggage, clothing, or goods of any kind found within the township are infected with any disease which may be dangerous to the public health, such justice of the peace shall, by warrant under his hand, directed to the sheriff or any constable of the county, require him to take with him as many men as the said justice shall deem necessary to secure such baggage, clothing, or other goods, and to post said men as a guard over the house or place where such baggage, clothing, or other goods shall be lodged, which guard shall take effectual care to prevent any person removing or coming near to such baggage, clothing, or other goods until due inquiry be made into the circumstances thereof.—§1651.

Impressing houses, etc., for keeping infected goods.

65. (1711.) Sec. 20. The said justice may also, by the same warrant, if it shall appear to him necessary, require the said officer, under the direction of the board of health, to impress and take up convenient houses or stores for the safe keeping of such baggage, clothing, or other goods; and the board of health may cause them to be removed to such houses or stores, or to be otherwise detained, until they shall, in the opinion of said board of health, be freed from infection.—§1652.

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* The Legislature has granted to the State Board of Health power to establish a system of inspection of immigrants and travelers, the disinfection of baggage, etc. The act takes effect September 18, 1885. After that date the appropriation to maintain such inspection and disinfection can be used if cholera or other dangerous communicable disease threatens, and the Governor of Michigan orders it.

The following section, from the "Act to establish a State public school for dependent and neglected children," is here inserted because of its relations to prevention of contagious diseases :—

PRECAUTION AGAINST INTRODUCTION OF CONTAGIOUS DISEASES TO THE STATE PUBLIC SCHOOL.

From Act 172 of 1871, as amended by Acts 144 of 1873, 58 of 1875, 145 of 1877, and 92 of 1881.

62 a. Sec. 23. That whenever on [the] examination provided for in this act the

Power of officer executing warrant.

66. (1712.) SEC. 21. Such officer, in the execution of such warrant, shall, if need be, break open any house, shop, or any other place mentioned in said warrant, where such baggage, clothing, or other goods shall be; and he may require such aid as shall be necessary to effect the execution of the warrant; and all persons shall, at the command of any such officer, under a penalty not exceeding ten dollars, assist in the execution of the warrant, if able to do so.—§1653.

EXPENSE OF SECURING, TRANSPORTING, AND PURIFYING INFECTED BAGGAGE, CLOTHING, OR OTHER GOODS.

Charges to be paid by owner.

67. (1713.) SEC. 22. The charges of securing such baggage, clothing, or other goods, and of transporting and purifying the same, shall be paid by the owner or owners thereof, at such rates and prices as shall be determined by the board of health.—§1654.

EXPENSE FOR HOUSES, STORES, LODGINGS, NECESSARIES, NURSES, OR ATTENDANTS.

Compensation for houses, nurses, etc

68. (1714.) SEC. 23. Whenever the sheriff or other officer shall take possession of any houses, stores, lodgings, or other necessaries, or shall employ any nurse or attendants, as provided in this chapter, the several parties interested shall be entitled to a just compensation therefor, to be paid by the county in which such person or property shall have been so employed or taken possession of.*—§1655.

QUARANTINE.

Township quarantine. Proviso.

69. (1718.) SEC. 27. Any township may establish a quarantine ground in any suitable place, either within or without its own limits: *Provided*, That if such place shall be without its limits, the assent of the township within whose limits it may be established shall be first obtained therefor.—§1659.

Quarantine for two or more townships. Proviso.

70. (1719.) SEC. 28. Any two or more townships may, at their joint expense, establish a quarantine ground for their joint use, either within or without their own limits: *Provided*, That if such place shall be without their limits, they shall first obtain the assent of the township within whose limits the same may be.—§1660.

Quarantine in townships bordering on certain lakes, rivers, etc.

71. (1720.) SEC. 29. The board of health in each township in this State bordering upon Lake Michigan, Lake Superior, Lake Huron, Lake St. Clair, or Lake Erie, or upon any of the principal rivers or straits connecting together any of the said lakes, or bordering upon any navigable waters uniting with any of the said lakes, rivers, or straits, may from time to time establish the quarantine to be performed by all vessels arriving within the limits of such townships, and may make such quarantine regulations as they shall judge necessary for the health and safety of the inhabitants.—§1661.

Quarantine regulations to extend to persons and goods in vessels.

72. (1721.) SEC. 30. The quarantine regulations so established shall extend to all persons, and all goods and effects, arriving in such vessels, and to all persons who may visit or go on board of the same.—§1662.

Penalty for violating quarantine regulations.

73. (1722.) SEC. 31. The said quarantine regulations, after notice shall have been given in the manner before provided in this chapter † shall be observed and complied with by all persons; and any person who shall violate any such regulations shall forfeit a sum not less than five dollars and not more than five hundred dollars.—§1663.

Vessels in certain cases to be removed to quarantine ground, etc.

74. (1723.) SEC. 32. The board of health in each township bordering upon any of the lakes, rivers, straits, or other navigable waters hereinbefore mentioned, may at all times cause any vessel arriving within the limits of the township, when such vessel or cargo thereof shall, in their opinion, be foul or infected, so as to endanger the public health, to be removed to the quarantine ground, and to be thoroughly purified at the expense of the owners, consignees, or persons in possession of the same; and they may also cause all persons arriving in or going on board of such

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Examination of child by physician.

judge of probate shall determine that the child is dependent on the public for support, he shall cause it to be examined by the county physician, if there be one, and if not, then by a respectable practicing physician, and shall in no case enter the order in his journal showing the child is admissible to this school, unless the physician making such examination shall certify in writing, under oath, filed in said court, that the child examined by him is, in his opinion, of sound mind, and has no chronic or contagious disease, and in his opinion has not been exposed to any contagious disease within fifteen days previous to such examination before the judge of probate. That a copy of such certificate shall be attached to the other papers provided by this act, to accompany each child to this school.—§1983.—*Added by Act 145 of 1877.*

* See also, on expenses, sections 1713, 1725, and 1706, Compiled Laws of 1871 (sections 67, 76, and 54, pages 3 and 4 of this circular).

† In section 1698, C. L. 1871, section 19, page 8 of this circular.

infected vessel, or handling such infected cargo, to be removed to any hospital under the care of the said board of health, there to remain under their orders.—§1664.

Master, etc., to answer on oath in regard to infections.

75. (1724.) SEC. 33. If any master, seaman, or passenger, belonging to any vessel, on board of which any infection may then be, or may have lately been, or which may have been at, or which may have come from, any port or place where any infectious disease prevails, that may endanger the public health, shall refuse to answer on oath, to be administered by any member of such board, such questions as may be asked him, relating to such infection or disease, by any member of the board of health of the township to which such vessel may come, such master, seaman, or passenger, so refusing, shall forfeit a sum not exceeding two hundred dollars; and in case he shall not pay such sum he shall suffer six months' imprisonment.—§1665.

EXPENSES OF QUARANTINE.

Expenses, by whom to be paid.

76. (1725.) SEC. 34. All expenses incurred on account of any person, vessel, or goods, under any quarantine regulations, shall be paid by such person, or by the owner of such vessel or goods, respectively.*—§1666.

IMMEDIATE CARE OF INFECTED PERSONS.

Board to make provision to prevent spread of small-pox, etc.

54. (1706.) SEC. 15. When any person coming from abroad or residing in any township within this State, shall be infected, or shall lately before have been infected, with the small-pox, or other sickness dangerous to the public health, the board of health of the township where such person may be shall make effectual provision in the manner in which they shall judge best for the safety of the inhabitants, by removing such sick or infected person to a separate house, if it can be done without danger to his health, and by providing nurses and other assistance and necessaries, which shall be at the charge of the person himself, his parents, or other person who may be liable for his support, if able; otherwise at the charge of the county to which he belongs.—§1647.

Provision in case infected person cannot be removed.

55. (1707.) SEC. 16. If any such infected person cannot be removed without danger to his health, the board of health shall make provision for him as directed in the preceding section, in the house in which he may be, and in such case they may cause the persons in the neighborhood to be removed, and may take such other measures as they may deem necessary for the safety of the inhabitants.—§1648.

HOSPITALS MAY BE ESTABLISHED FOR PERSONS INFECTED WITH SMALL-POX OR OTHER DANGEROUS DISEASE.

Hospitals for reception of persons having small-pox, etc.

49. (1726.) SEC. 35. The inhabitants of any township may establish within their township and be constantly provided with one or more hospitals for the reception of persons having the small-pox, or other disease which may be dangerous to the public health.—§1667.

HOSPITALS TO BE CONTROLLED BY BOARD OF HEALTH.†

By whom hospitals to be regulated, etc.

50. (1727.) SEC. 36. All such hospitals shall be subject to the orders and regulations of the board of health, or a committee appointed by such board for that purpose; but no such hospital shall be established within one hundred rods of any inhabited dwelling-house situated in an adjoining township, without the consent of such adjoining township.—§1668.

Physicians, etc., to be subject to regulations of board, etc.

51. (1729.) SEC. 38. When any hospital shall be so established, the physician attending the same, the persons inoculated or sick therein, the nurses, attendants, and all persons who shall approach or come within the limits of the same, and all such furniture and other articles as shall be used or brought there, shall be subject to such regulations as shall be made by the board of health, or of the committee appointed for that purpose.—§1670.

BOARD OF HEALTH MUST PROVIDE HOSPITAL ON OUTBREAK OF SMALL-POX OR OTHER DANGEROUS DISEASE.

When board of health to provide hospitals.

52. (1730.) SEC. 39. When the small-pox or any other disease dangerous to the public health shall break out in any township, the board of health shall immediately provide such hospital or place of reception for the sick and infected, as they shall judge best for their accommodation and the safety of the inhabitants; and such hospitals and places of reception shall be subject to the regulations of the board of health, in the same manner as hereinbefore provided for established hospitals.—§1671.

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* See C. L., Secs. 1713 and 1714 (Secs. 67 and 68, page 8 of this circular.)

† Sec. 1733, Comp. Laws of 1871 (Sec. 58, page 5 of this circular), provides a penalty for violation of hospital regulations.

REMOVAL OF INFECTED PERSONS TO HOSPITALS.

53. (1731.) SEC. 40. The board of health shall cause such sick or infected persons to be removed to such hospitals or places of reception, unless the condition of the sick person be such as not to admit of removal without danger to life; in which case the house or place where the sick shall remain shall be considered as a hospital to every purpose before mentioned and all persons residing in or in any way concerned with the same, shall be subject to the regulations of the board of health, as before provided.—§1672.

When infected persons to be removed to hospital, etc.

HOSPITAL REGULATIONS, PENALTY FOR VIOLATING.

58. (1733.) SEC. 42. If any physician or other person in any of the hospitals or places of reception before mentioned, or who shall attend, approach, or be concerned with the same, shall violate any of the regulations lawfully made in relation thereto, either with respect to himself, or his or any other person's property, the person so offending shall for each offense, forfeit a sum not less than ten nor more than one hundred dollars.—§1674.

Penalty for violating regulations of hospitals.

CARE TO PREVENT SPREAD OF INFECTION—NOTICE OF INFECTED PLACES.

45. (1732.) SEC. 41. When the small-pox, or any other disease dangerous to the public health, is found to exist in any township, the board of health shall use all possible care to prevent the spreading of the infection, and to give public notice of infected places to travelers, by such means as in their judgment shall be most effectual for the common safety.—§1673.

Board to prevent the spread of dangerous disease.

DUTIES OF HEALTH OFFICERS, WHEN NOT OTHERWISE INSTRUCTED, ON OUTBREAK OF A DANGEROUS DISEASE.

Act No. 137, Laws of 1883, entitled "An act to specify certain duties of health officers and provide for compensation therefor, in townships, cities, and villages where the health officer is not otherwise instructed by the local board of health."

46. SECTION 1. *The People of the State of Michigan enact*, That whenever the health officer of any township, city, or village in this State shall receive reliable notice or shall otherwise have good reason to believe that there is within the township, city or village of which he is the health officer, a case of small-pox, diphtheria, scarlet fever, or other communicable disease dangerous to the public health, it shall be the duty of said health officer, unless he is or shall have been instructed by the board of health of which he is an executive officer, to do otherwise, immediately to investigate the subject, and in behalf of the board of health, of which he is an executive officer, to order the prompt and thorough isolation of those sick or infected with such disease, so long as there is danger of their communicating the disease to other persons; to order the prompt vaccination or isolation of persons who have been exposed to small-pox; to see that no person suffers for lack of nurses or other necessaries because of isolation for the public good; to give public notice of infected places by placard on the premises, and otherwise if necessary; to promptly notify teachers or superintendents of schools concerning families in which are contagious diseases; to supervise funerals of persons dead from scarlet fever, diphtheria, small-pox, or other communicable disease which endangers the public health; to disinfect rooms, clothing, and premises, and all articles likely to be infected, before allowing their use by persons other than those in isolation; to keep the president of his own board of health, and the secretary of the State board of health constantly informed respecting every outbreak of a disease dangerous to the public health, and of the facts so far as the same shall come to his knowledge, respecting sources of danger of any such diseased person or infected article being brought into or taken out of the township, city or village of which he is the health officer.

Powers and duties of health officers in reference to diseases dangerous to public health.

47. SEC. 2. In the absence of regulations conflicting therewith, made and published by the local board of health, and still remaining in force, the provisions of section one of this act shall have the force of regulations made and published by the local board of health; and whoever shall violate the provisions of section one of this act, or the orders of the health officer made in accordance therewith, shall forfeit for each such offense a sum not exceeding one hundred dollars.

Provisions to have force of regulations of local boards of health in certain cases.

Penalty for violation of provisions.

48. SEC. 3. In the fulfillment of the requirements of this act, the health officer, unless other provision shall have been made in accordance with law, shall be entitled to receive from the township, city, or village of which he is health officer, compensation at the rate of not less than two (2) dollars per day: *Provided*, That this section shall not be construed to conflict with any action by the local board of health, under section sixteen hundred and ninety-three, of the compiled laws of eighteen hundred and seventy-one, as amended by act number two hundred and two, of the laws of eighteen hundred and eighty-one.

Compensation of health officer.

Proviso.

PERMITS FOR REMOVAL OF SICK PERSONS OR INFECTED ARTICLES.*

Under the law in Michigan, whoever takes the body of a person sick with or dead from a communicable disease, or any person or article capable of conveying disease, into any township, city or village in Michigan, without a written permit granted by the board of health of the locality *from* which, and also of the locality *to* which the infected body or article is taken, does so at his peril.

The law authorizing the granting of permits, section 57 of the Public Health Laws, section 1705 of the Compiled Laws of 1871, and section 1646 of Howell's Annotated Statutes, is as follows:—

Board may permit removal of infected articles, etc.

57. (1705.) SEC. 14. The board of health may grant permits for the removal of any nuisance, infected article, or sick person within the limits of their township, when they shall think it safe and proper so to do.—§1646.

The provisions of the foregoing section and of other sections in chapter XLVI of the Compiled Laws of 1871, apply to cities and villages by reason of Act No. 145, Laws of Michigan, 1879 (§1681, Howell's Statutes, 16 of Public Health Laws), excepting in cases where the charters of cities or villages contain provisions inconsistent therewith.

It should be distinctly understood that a permit by the board of health for the removal of an infected article, dead body, or sick person is *good only within the limits of the township, city, or village in which the permit is granted.*

Such a permit should not be granted by a board of health except under such conditions and circumstances as will not endanger "the public health and safety." Relative to an infected dead body, if a permit be granted it should be conditioned as follows:

RULE 1. Before being placed in the coffin, the remains of the deceased shall be wrapped in a sheet thoroughly saturated with a strong solution of chlorinated soda, or chloride of zinc, one-half pound to the gallon of water, or a solution made in proportions as follows: water, one gallon; sulphate of zinc, eight ounces; common salt, four onces.

RULE 2. The coffin shall be packed in a strong box, and shall be surrounded by sawdust, saturated with zinc solution of a strength equal to that required by Rule 1, above.

RULE 3. The body shall not be accompanied by persons who (or articles which) have been exposed to the infection of the disease.

RULE 4. The coffin shall not be opened, neither shall the box be opened, at the place of destination.

RULE 5. The burial shall take place immediately after arrival at the place of destination.

RULE 6. There shall be no public funeral.

RULE 7. The health officer of..........................(the locality to which the body is consigned), shall have from the person in charge of the body, such timely notice of the time of its arrival within his jurisdiction as will enable him to supervise its reception.

RULE 8. In case there is necessity for transhipment of the body or other infected article, the health officer in whose jurisdiction the transhipment is to occur, shall have such timely notice of the time of its arrival within his jurisdiction as will enable him to supervise its transhipment.

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* Infectious or communicable diseases include small-pox, scarlet fever, diphtheria, typhus fever, cholera, etc.

Any person proposing to transport a dead body or other infected article, should first make sure that the body or other article will be permitted to enter and remain in the locality to which it is to be consigned; and that the health officer of the locality to which the body or other article is to go, shall be informed of the proposed removal in time to attend to its reception in the safest manner. This may, perhaps, be secured by requiring, as a prerequisite, to see a permit, for this particular body or article, from the board of health in the locality to which the removal is proposed. It will also be conducive to safety if the board of health in each locality from which a removal is proposed will send timely notice to the health officer into or through whose jurisdiction it is proposed to send an infected body or article.

THE LOCAL BOARD OF HEALTH SHOULD MAKE AND PUBLISH REGULATIONS RELATIVE TO COMMUNICABLE DISEASES.

21. (1695.) SEC. 4. The said board shall also make such regulations as they may deem necessary for the public health and safety, respecting any articles which are capable of containing or conveying any infection or contagion, or of creating any sickness, when such articles shall be brought into, or conveyed from, their township, or into or from any vessel; and if any person shall violate any such regulation, he shall forfeit a sum not exceeding one hundred dollars.—§1636.

Respecting articles capable of conveying contagion, etc.

The foregoing section of law is a very important one; but it is useful only after action has been taken by the local board of health; therefore, every board of health should make and publish and constantly maintain regulations to prevent the introduction of articles capable of "conveying infection or contagion." Such regulations should relate to:

(1.) Persons sick with a communicable disease. (2.) Bodies of persons dead of a communicable disease. (3.) Persons who have been with the dead or living bodies infected with a communicable disease, or in a room or place occupied by such a body. (4.) Baggage, clothing, food, drink, or other articles capable of conveying a communicable disease.

Such regulations may be in some such form as follows:

REGULATIONS RELATIVE TO INFECTIOUS PERSONS OR SUBSTANCES.

No person sick with cholera, small-pox, diphtheria, scarlet fever, or any other dangerous communicable disease; no corpse of a person dead from one of the above named diseases, or from any other dangerous communicable disease; and no article which has been infected or is liable to propagate or convey any such disease, shall be brought within this [township, city, or village, as the case may be] without the special permit and direction of the board of health thereof.

The foregoing regulations shall remain in force until revoked by the board of health of this [township, city, or village.]

Whoever violates the foregoing regulations is liable to, and should incur the full penalties of the law.

Permits for the removal of infected persons or articles, in accordance with law, may be granted by this board, and by its health officer when the board is not in session, under circumstances and conditions as recommended by the State Board of Health.

Signed,

Members of the Board of Health of the [township, city, or village] of..............

NOTICE OF ALL REGULATIONS BY BOARD OF HEALTH.

Notice of regulations, how published.

19. (1698.) SEC. 7. Notice shall be given by the board of health of all regulations made by them, by publishing the same in some newspaper of the township, if there be one published therein, and if not, then by posting them up in five public places in such township; and such notice of said regulation shall be deemed legal notice to all persons.—§1639.

The making and the publishing of regulations relative to "articles which are capable of containing or conveying any infection or contagion," are important duties which no local board of health in Michigan should neglect.

By direction of the State Board of Health.

Very respectfully,

HENRY B. BAKER,
Secretary.

GOOD HEALTH RESULTS FROM SANITARY WORK.

REPORT BY THE SECRETARY OF THE STATE BOARD OF HEALTH.

The following bulletin, issued by the Secretary of the State Board of Health, under the above heading, explains the belief that the greatly lessened prevalence, in Michigan in the summer of 1885, of nearly all forms of disease, was largely due to sanitary work:

Sanitary authorities have claimed that the sanitary work which they have recommended to be done as a preparation for cholera,—such as preventing and abating nuisances; attending to drains, sewers, privies, and cesspools; cleaning up generally, and unusual carefulness in regard to foods and drinks,—would reduce the sickness and deaths from other diseases, even if cholera did not come. The weekly reports for July, 1885, to the Michigan State Board of Health, by physicians in different parts of the State, indicate that this claim is being realized in Michigan, so far as relates to the lessened sickness,—it having been lessened from nearly every disease, and greatly lessened from fevers and from diarrheal and other diseases believed to be especially influenced by sanitary conditions; and this is true notwithstanding the meteorological conditions in that month were rather more than usually unfavorable to health.

Observations in Michigan for many years have shown that in July the meteorological conditions especially unfavorable to health are: high temperature, excessive humidity of the atmosphere, and deficiency of ozone. The bulletin of "Health in Michigan, July, 1885," says: "For the month of July, 1885, compared with the average of corresponding months for the seven years, 1879-1885, the temperature was slightly higher, the absolute and the relative humidity were more, and the day and the night ozone were less."

Compared with the average for the months of July in the seven years, 1879-1885, remittent fever, intermittent fever, dysentery, consumption of lungs, cholera infantum, diarrhea, cholera morbus, measles, and whooping-cough were less prevalent in July, 1885.

A large part of this decrease in sickness has undoubtedly been due to the medical and sanitary journals and the newspapers, which have constantly kept before the people the necessity for sanitary work and the facts as to the spread of cholera in Europe.

It remains to be seen to what extent efforts for the exclusion of cholera from this country, and the general preparation for cholera by boards of health and the people, shall prove effectual; but even if cholera shall not be entirely prevented, there will remain the belief that the measures which have so greatly decreased the sickness from other diseases cannot but have had their influence in decreasing it; and if cholera does not occur in this country it seems quite probable that, by reason of the suffering elsewhere, there may be as many cases of serious sickness prevented in this country as there have been cases of cholera in Europe.

By direction of the State Board of Health.

HENRY B. BAKER,
Secretary.

Office of the State Board of Health,
Lansing, Michigan, August 7, 1885.

The following bulletin, issued Sept. 4, 1885, shows that sickness in Michigan was lessened in August, 1885, as well as in July:

Good Health in Michigan.

In August, 1885, compared with the average in August for the seven years, 1879–1885:

Diseases—Arranged in Order of Greatest Diminution of Sickness in August, 1885.	Per Cent of reports stating Prevalence of Diseases.		Per Cent of Reports, less (—) or more (+), In August, 1885, than the Average for August, 1879–85.
	In August, 1885, (310 reports.)	Average in August, 1879-1885.	
Dysentery	33	53	—20
Intermittent fever	63	81	—18
Remittent fever	41	57	—16
Typho-malarial fever	12	25	—13
Cholera infantum	37	49	—12
Consumption of lungs	49	61	—12
Cholera morbus	52	60	—8
Diarrhea	80	87	—7
Influenza	18	25	—7
Measles	2	8	—6
Bronchitis	37	43	—6
Diphtheria	13	18	—5
Typhoid fever	9	14	—5
Whooping-cough	17	22	—5
Erysipelas	17	20	—3
Inflammation of kidney	17	20	—3
Rheumatism	58	61	—3
Inflammation of bowels	18	20	—2
Pneumonia	11	13	—2
Membranous croup	2	3	—1
Neuralgia	56	57	—1
Scarlet fever	10	11	—1
Inflammation of brain	6	7	—1
Cerebro-spinal meningitis	6	6	=
Small-pox	0	0.3	=
Puerperal fever	6	5	+1
Tonsilitis	38	32	+6

Sanitarians have claimed that the observance of sanitary precautions would diminish sickness from many diseases; a lessening of sickness in the summer of 1885 was accordingly expected. On studying the combined reports of sickness in Michigan in July, 1885, compared with the average for July in the seven years, 1879–1885, it is found that sickness from all the more important diseases was in July, 1885, much less than the average. A supplementary bulletin was issued giving a list of the diseases, arranged in order of greatest diminution of prevalence. From this, and from other information received at this office, it seems very probable that much of the great decrease in sickness was due to the increased sanitary precautions on account of the expected visitation of cholera.

A study of the statistics now exhibits a similar decrease in sickness from nearly every disease in August, 1885, compared with the average of preceding Augusts—1879-1885. From fevers and bowel complaints there is shown to be (as appears by the accompanying table) a very marked decrease. This seems to confirm what was claimed in the supplementary bulletin for July. It is proper to state, however, that although in July, 1885, the meteorological conditions were not very favorable, in August, 1885, they were favorable to health.

HENRY B. BAKER,
Secretary.

LANSING, MICH., Sept. 4, 1885.

In confirmation of the conclusion arrived at in these bulletins, numbers of letters have been received from physicians in different parts of the State, and a few are given as samples.

Under date of August 10, 1885, Dr. H. W. Jones, health officer of Houghton, Mich., said:

"We are having much less sickness this year, owing, I think, principally to our having a new supply of water of the purest quality from a natural spring, on top of the mountain that supplies the whole town, wells being condemned and abandoned. The town has also been thoroughly cleaned up, and that, too, has added much to our freedom of epidemic of the usual summer complaints."

In reply to a letter from this office asking for an explanation of the greatly lessened prevalence of sickness in Petoskey in summer of 1885, Dr. H. T. Calkins, health officer of that village, says:

"I have to state that the village authorities have caused all the streets to be thoroughly cleaned, and any sources of disease on unoccupied territory removed. The people, in response to an appeal and recommendation made by the health officer, have cleaned up alleys and private premises to a very satisfactory degree. There has been no change in water-supply or in the source. The water is obtained from a large well, stoned up in water-lime, and about 12 feet deep, dug in the sand, gravel, and boulders, about 50 feet from the water line of the lake. It is pumped from thence by water power and conveyed through iron mains to a reservoir of 10,000 gallons, on nearly as high ground as there is about the town. * * * * The authorities have the reservoir washed out at stated intervals, so that I know of no reason why the water is not pure and wholesome."

Dr. H. F. Ewers, health officer of Union City, under date of August 24, 1885, said: "This is said to be the healthiest summer ever known in this locality:" and Dr. Edwin A. Withey, health officer of Bangor, Van Buren county, wrote: "Past summer in this vicinity exceptionally healthy."

August 7, 1885, Dr. E. G. Folsom, health officer of Mt. Clemens, wrote:

> "I have made, since June 1, quite a thorough inspection of the city, and have abated over sixty nuisances; among other things, forty privy vaults. I have sent to the common council a written report, with a recommendation that an ordinance be passed prohibiting the digging of any more vaults. The health of this section now is something remarkable."

Dr. H. B. Hemenway, health officer of Kalamazoo, wrote, September 10, as follows:

> "In order that you may be the better posted upon sanitary progress in this section, I will report that Kalamazoo seems at present to be in an unusually healthy condition. * * * * The city has nearly finished laying new water mains through the business portion, and on the residence streets leading to the water-works. The street grades have been changed in many places and the gutters cleaned, The city has just purchased the Kuerr mill power on Arcadia creek, and will have the dam removed, thus doing away with much stagnant or nearly stagnant water through the heart of the city. The ordinance passed last year, prohibiting the use of this creek for sewage purposes is being enforced; and though it is still so used to some extent there is a marked improvement in its condition. The sewage system is being rapidly extended. At the last council meeting sewers were ordered on four streets. The people are beginning to appreciate them, and are fast connecting with them. The old Whitcomb mill on East avenue has long been an injury to the city. By its dam the water of the river has been sent around the 'Ox bow,' a distance of three-quarters of a mile, instead of running through the race of 500 feet. At the last council meeting it was voted to purchase this power and certain lands adjoining, paying therefor $3,000. A little over $1,000 of this has been raised by private subscription, leaving about $2,000 to be paid by the city. The dam is to be removed, the race channel widened, and a street laid out along its south bank, connecting with Mill street, which will be projected to meet it. This change will improve the drainage of about a quarter of the city."

From the annual reports for the year 1885 of health officers and clerks of local boards of health, it is possible to gain some idea of the sanitary condition and of the amount of sickness in 1885 compared with former years. Such reports were received from 616 health officers and 585 clerks, representing 874 of the 1422 townships, villages, and cities in Michigan. In reports from about 228 of the 874 localities nothing was said in regard to sanitary condition. In about 265 localities there had been little or no sickness reported, and some of these were in a good sanitary condition. About 180 reported a good sanitary condition without reference to amount of sickness. These reports of *little or no sickness* and of *good sanitary condition* during the year 1885 do not necessarily indicate any particular activity on the part of the local boards of health, or of the people in sanitary work: the good sanitary condition may be natural.

Forty-one localities, however, were reported to be in *better sanitary condition*, but no reference was made as to increase or decrease of sickness; 121 localities were reported to have had *less sickness* as the result of *better sanitary conditions;* 25 localities only were reported to be in *poor sanitary condition* In one locality there had been no improvement in regard to sanitation, and in 5 there had been *increase of sickness* for which no cause was ascribed. Eight localities were said to have had *increase of sickness* due to *bad sanitary conditions.*

In these figures a fact to be noted is that 162 of 874 localities were positively stated to have been placed, in 1885, in a *better sanitary condition* than they had formerly enjoyed; and that 121 of the 162 had less sickness in 1885 than formerly, which was believed to be fairly attributable to the improvement in sanitary condition. The work of improving the sanitary condition consisted in draining, abating nuisances, providing pure water-supply, cleaning up, etc.

A large number of local boards of health, according to these annual reports from health officers and clerks, took extra precautions in 1885 against the introduction and spread of communicable diseases, with the most gratifying results. While a few more cases of some of the communicable diseases were reported in 1885 than in 1884, the method of collecting such information was improved, and thus probably a larger per cent of the actual number of cases were reported, making an apparent increase in those diseases while it is possible there may have been a decrease.

A few samples of reports in 1885 from health officers and clerks in regard to sanitary condition are given:

Allegan.—"Improved drainage and better water-supply."

Ganges township, Allegan county.—"Less sickness; cause, better drainage and better water."

Otsego.—"Good sanitary measures adopted."

Alpena.—"Sanitary inspector appointed to see that city was kept clean."

Elk Rapids township, Antrim county.—"Local board voted to sustain health officer in carrying out all sanitary measures."

Nashville.—"Better than usual sanitary measures."

Hastings.—"Decrease of sickness due to drainage and disinfection. Clean streets and privy vaults."

Thornapple township, Barry county.—"Sickness increased one-fourth. No sanitary measures adopted."

Pinconning township, Bay county.—"Thorough disinfection of closets and cesspools ordered by local board of health."

Bay City.—"Decrease of sickness due to better system of sewerage, thorough cleaning up, and disinfection of premises."

Hampton township, Bay county.—"Decrease of sickness probably due to sanitary improvement and good drainage."

Frankfort.—"Good sanitary condition. Less than average amount of sickness."

Three Oaks.—"Bad sanitary condition. Local board inactive. Poor drainage."

Berrien Springs.—"Decrease of sickness probably due to good sanitation."

Watervliet township, Berrien county.—"Good sanitary condition. Decrease of sickness probably due to improved methods in families for avoiding disease."

Sheridan township, Calhoun county.—"Good sanitary condition. Less than average sickness."

Newton township, Calhoun county.—"Sickness decreased. No cause known."

Evangeline township, Charlevoix county.—Sanitary condition "not good. Sanitary reform needed." Increased sickness.

Frost township, Clare county.—"Measures for good drainage and general sanitation."

St. Johns.—"Decrease of sickness probably due to better sanitation."

Grayling township, Crawford county.—"Diphtheria cases quarantined, and everybody required to clean and disinfect premises."

Escanaba.—"Better attention given to sanitation."

Sumner township, Gratiot county.—"Decrease of sickness due to better drainage."

Newark township, Gratiot county.—"Bad sanitary condition. Unclean wells, and privies."

Hancock.—"Measures taken to restrict scarlet fever and abate nuisances."

Dansville.—"Local board ordered general cleaning and disinfection of privies and removal of compost."

Lansing township, Ingham county.—"Strict rules enforced during the year."

Williamston.—Decrease of sickness attributed to better system of drainage.

Kalamazoo.—"Decrease of death-rate due to improved sanitation; use of 'Holly water' instead of well water."

Kalkaska township, Kalkaska county.—"Decrease of sickness due to greater vigilance on part of the people."

Cedar Springs.—"General healthfulness due to enforcement of good sanitary measures."

Lowell.—"Sanitary rules enforced and nuisances abated."

Sparta.—"Good sanitary condition. Printed instructions to prevent contagious diseases circulated; nuisances abated, etc."

Virginius township, Kent county.—"Slaughter houses near highways closed; other nuisances abated."

Glencoe township, Lake county.—"Lumber camps disinfected; cesspools filled up."

Burnside township, Lapeer county.—"Good sanitary condition. Sickness *much* less than average."

Metamora.—"Decrease of sickness due to better drainage."

North Branch.—"Decrease of sickness due to general cleanlinesss and good drainage."

Morenci.—"Cause of decrease of sickness unknown."

Mackinac.—"Good sanitary condition. Disinfectants freely and judiciously used."

New Haven township, Macomb county.—"Printed instructions circulated for householders to renovate and clean premises."

Onekama township, Manistee county.—"Bad sanitary condition. Increase of sickness due to defective drainage."

Ash township, Monroe county.—Decrease of sickness due to "enforcing rules of board of health."

Greenville.—Decrease of sickness due to "better sanitary conditions."

Le Roy township, Osceola county.—Good sanitary condition. Decrease of sickness due to "close attention to sanitary measures. General distribution of circulars and pamphlets issued by State Board of Health."

Orient township, Osceola county.—"Clean privies and clean yards."

Gaylord.—"No sickness, owing to splendid sanitary condition."

Frankenmuth township, Saginaw county.—Decrease of sickness due to "better drainage of entire township."

Buel township, Sanilac county.—"Bad sanitary condition. Source of danger to public health,—ignorance of the people in regard to contagious diseases."

Marine City.—Decrease of sickness due to "pure water-supply: greater attention to sanitation."

Clay township, St. Clair county.—Good sanitary condition. "Sickness 50 per cent less than average."

Vassar.—"Sickness less than average."

Wayne.—"Every precaution taken to distribute circulars, clean streets, privies, and wells."

Taken in connection with what was previously known of the work of local health authorities, and of the attention devoted to such subjects by the newspapers and journals, because of the prevalence of cholera in Europe in 1884 and 1885, the quotations and reports seem to be convincing that in Michigan in 1885 there was a very general attention given to improving sanitary surroundings; that local boards of health were unusually active; and that there was a very noticeable decrease in the amount of sickness in Michigan during the year 1885. Whether or not all of the decrease of sickness is to be attributed to the efforts put forth, cannot now be positively stated; whether some of it was due to favorable meteorological conditions, cannot well be told until after the weekly reports of sickness and the reports of the tri-daily observations of meteorological conditions in 1885 have been carefully compiled and compared with similar compilations for preceding years.

It is very gratifying to have to report this lessened amount of sickness and the increased attention that has been paid to sanitary matters by boards of health and other persons during the year 1885. Further, it is to be hoped that this attention to sanitary matters will increase, that at least some of the factors in the causation of disease may be eliminated.

HENRY B. BAKER,
Secretary.

STATE HEALTH INSPECTION OF TRAVEL.

UNDER THE DIRECTION OF THE STATE BOARD OF HEALTH, AND OF THE UNITED STATES; AND OTHER EFFORTS TO PROTECT MICHIGAN FROM SMALL-POX.

BY THE SECRETARY OF THE STATE BOARD OF HEALTH.

The ravages of cholera in Europe during the summer and fall of 1884 created a general fear that that disease would be brought to the United States in the course of the next year; and the fear was justified by former experience. On January 8, 1885, the retiring governor of Michigan, Hon. Josiah W. Begole, in view of this expectation of the introduction of cholera into the United States, addressed the Legislature of Michigan on that subject as follows:

DANGER FROM CHOLERA.

"Cholera has never prevailed as extensively in Europe as during the last few months without sooner or later coming to the United States. From our situation on the great lines of travel and of immigration, Michigan is especially liable to receive infected persons or infected baggage. Our local boards of health are authorized to make such regulations as they may deem necessary for the public health and safety, respecting any articles which are capable of containing or conveying any infection or contagion, or of creating any sickness, when such articles shall be brought into, or conveyed from, their township, or into or from any vessel.' (Sec. 1636, Howell's Annotated Statutes.) Methods of travel have changed so much since the law was passed, and the amount of travel has become so great, as to make the inspection of travelers and the proper care of infected persons and infected baggage, at certain points, in time of great danger from an infectious disease like cholera or small-pox, a State or National rather than a local affair. The cities of Port Huron and Detroit can hardly be asked to bear the expense of such an inspection of the thousands of immigrants annually entering the country at these cities, as shall protect the inhabitants of Wisconsin, Illinois, Iowa, Minnesota, and Dakota from the introduction of dangerous contagious diseases. Yet there are times when, if such an inspection is not maintained, every town in Michigan is liable to receive infected immigrants or infected baggage, and to have a number of its inhabitants infected before the danger is known. The numerous outbreaks of small-pox thus traceable to immigrants, detailed in the reports of the State Board of Health, show that the danger demands consideration. The attention of the National government has been repeatedly called to this subject, and for one year an inspection of immigrants was maintained at Detroit and Port Huron by the coöperation of the National Board of Health with the Michigan State Board of Health.

"In view of the danger from cholera, I would recommend an appropriation for an epidemic contingent fund, to be used in the discretion of the Governor, under the direction of the State Board of Health, for the prevention or suppression of outbreaks of cholera, should the danger become imminent and a necessity arise for the use of said fund or any part of it.

"I would also recommend to your consideration the question whether the law relating to the prevention and suppression of epidemics of contagious diseases requires any changes as regards inspection and care of infected travelers and their effects at points where the amount of travel is so great as to practically place the work beyond the resources of the local board of health; and whether the Legislature ought not to invite the coöperation of the national government in such inspection at points in Michigan where the inspection would benefit all the Northwestern States, especially as the national government claims the sole right to tax the immigrants for the expenses of an inspection."

This recommendation was promptly followed by the introduction into the Legislature, by Hon. P. P. Shorts, of a bill making an appropriation to be used by the State Board of Health, whenever the Governor should deem necessary, for the purpose of maintaining an inspection of travelers and baggage entering Michigan to prevent the introduction and spread of cholera or other communicable diseases. The bill as it finally became a law is Act No. 230, Laws of 1885.*

Governor Alger affixed his signature to this act on June 20, 1885; but unfortunately the law was not to take effect until September 18. There was danger from cholera every day, and alarming intelligence had for two months been reaching us of the foothold gained by small-pox in the city of Montreal, Canada. It is well worth recording that the proximity of what threatened, and finally came to be, a great epidemic of small-pox, had much to do in determining the action of the legislature in regard to this contingent appropriation; and there can be no doubt that but for this new danger the legislature would have struck out the words, "or other dangerous communicable disease," making the act of no use except for the prevention of the introduction of cholera.

SMALL-POX IN MONTREAL, CANADA.

The origin of the epidemic of small-pox in Montreal in 1885 is well known. Henry R. Gray, chairman of the Montreal board of health, under date of July 28, 1885, wrote to this office that a Pullman car conductor named George H. Langley "arrived in Montreal February 28, and was admitted into the Hotel Dieu hospital. He was in the hospital during his illness, but was never isolated; and from this case the outbreak is directly traced." In the same letter it is stated that another Pullman car conductor, H. Shattuck, was exposed to small-pox while in his car near Chicago on February 9; and the rash appeared upon him February 27, after his arrival in Montreal. He was "isolated by his physician, and the board of health coöperated; every precaution was taken, and it never spread from the house in which he was quarantined."

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* Act No. 230, Laws of 1885. To provide for the prevention of the introduction and spread of cholera and other dangerous communicable diseases:

SECTION 1. *The People of the State of Michigan enact*, That whenever in the opinion of the Governor, it may be deemed necessary, he may draw from the general fund on the warrant of the auditor general, not to exceed the sum of ten thousand dollars ($10,000.00) to be used by the State Board of Health, to prevent the introduction, or spread in this State, of cholera or other communicable diseases dangerous to public health.

SEC. 2. At such ports or places, or on such lines of travel as there may be danger of the introduction into this State of cholera or other dangerous communicable diseases, the State Board of Health shall have power to establish such systems of inspection as may be practicable and needful to ascertain the presence of the infection of cholera or other dangerous communicable desease in the persons of immigrants or travelers, in wearing apparel, baggage or freight; to question on oath, without cost to the State or person so questioned, which oath a duly appointed inspector of the State Board of Health is hereby authorized to administer to the immigrant, traveler, or other person, as to the place from which the suspected person, baggage or freight came, the time elapsed since his or its exposure to cholera or other dangerous disease, and on other subjects on which information is needed, and the State Board of Health shall have power to order such disinfection of baggage or other articles which are infected or liable to be infected, and to cause such isolation of persons or things infected or liable to be infected, as may be necessary for the public safety, by placing it or them in the care of the local board of health, or by other practicable methods, to the end that the object of this act expressed in its title shall be fulfilled.

SEC. 3. It shall be the duty of the State Board of Health to frame and publish rules for the conduct of inspection under this act. Whoever shall willfully violate the rules of the State Board of Health made in pursuance of this act, shall on conviction be deemed guilty and punished as in cases of misdemeanor.

Approved June 20, 1885.

There is good reason for believing that if the Montreal authorities had intelligently, vigorously, and promptly supported the chairman of the city board of health, the terrible epidemic might have been avoided. From April 7, 1885, to July 15, there were only 44 deaths from small-pox in the city, and 28 of these were in one hospital. An efficient health service such as Detroit now possesses would in that time have made any further spread of the disease impossible; but Mr. Gray, the chairman mentioned above, seems to have stood almost alone in capacity and in an appreciation of the importance of restrictive measures. He was powerless to effect any thorough measure because of the dense ignorance of the French-Canadians,—among whom 35 of these 44 deaths occurred,—and more especially because of the general policy of the Montreal city government. Montreal has been described as a "close-fisted corporation." Ignorance in that city is not confined to the French; for there are two physicians in the city, one a professor in a medical school, who declare that small-pox is not a contagious disease, and who, of course, cry out against vaccination. In spite of the fact that nearly all of the 28 deaths from small-pox mentioned above were of persons who had never been vaccinated, the anti-vaccinators went about to inflame the passions of the ignorant. They wrote to the newspapers warning the people against vaccination, and were assisted by the fact that a few sickly children had very bad arms after vaccination. The agitation caused by these people was sufficient to overcome the board of health, and free vaccination had for a time to be stopped.

Small-pox having been allowed to gain a firm foothold in Montreal by the middle of July, 1885, it suddenly became very destructive. In August there were 239 deaths reported; in September, 659; and in October, 1,393. From that time it began slowly to decline in violence. The disease spread rapidly throughout the province of Quebec until it was prevalent in 36 towns, and several places in Ontario had outbreaks. It was also carried from Montreal into Maine, New Hampshire, Vermont, Massachusetts, Rhode Island, New York, Wisconsin, Pennsylvania, and Illinois, but was not allowed to spread in those States.

INTRODUCTION OF SMALL-POX INTO THE UNITED STATES.

Exposed to the epidemic of small-pox, as Michigan was, probably more than any other state, its escape without a single outbreak, during the continuance of the Montreal epidemic, is a subject for remark and especial congratulation. Detroit and Port Huron are on the great lines of travel from east to west, and Port Huron is only second to New York city in the number of immigrants reaching the United States at her port. Every fall thousands of French-Canadians pass through Port Huron to the lumber camps of Northern Michigan. So great is the travel through Detroit and Port Huron, that those places are of National importance, and prevention there of the introduction of small-pox cases and of infected goods means protection for the whole northwest. This can be illustrated in no better way than by giving the details of two outbreaks of small-pox in Wisconsin. About August 6, 1885, a French-Canadian family, consisting of the mother and six children, passed through Port Huron from Montreal to Marinette, Wisconsin. They met with no detention at Port Huron, or at any point through Michigan, Illinois or Wisconsin, as it was before the system of inspection was established. From this family resulted eighteen cases of small-pox, with four deaths. The outbreak was promptly suppressed by the health authorities at Marinette. Another French family, named Picher, left their home near Montreal, Sept. 22, 1885, were detained at Detroit, "examined, fumigated, and vaccinated." The family consisted of father, mother and seven children. They passed Detroit Sept. 23, and reached their destination near Coleman, in the township of Peshtigo, Wisconsin, on the night of Sept. 24. About a week after their arrival in Wisconsin, four of the children were taken sick with small-pox, but it was not discovered until a large number had been exposed. J. J. Sherman, M. D., health officer at Marinette, Wis., wrote that "the vaccination at Detroit was complete and effective on three, and greatly modified the attack on the other four."

In the case of the Picher family, as the disease had not shown itself on them while they were in Detroit, it may be said that complete protection to the people was not afforded by the inspection service at Detroit. Still the disease did not spread from the family, no deaths occurred, and the thorough fumigation of the clothes and goods of the family may have been the means of preventing outbreaks. In this connection it may be well to give the following suggestion from Dr. J. J. Sherman, the health officer of Marinette, Wis.:

"Of course, it does the immigrant good to vaccinate, and no doubt prevents the spread of small-pox altogether in many cases, * * * only I do think that immigrants from infected districts should be held, when they have not been vaccinated or had small-pox, until the vaccination gives evidence of working, or until it was morally certain that the disease was not in the incubative stage; and if possible, notices forwarded to health officers of the towns to which they were going, that they might be kept under surveillance until all danger of contagion was passed."

DUTY OF NATIONAL GOVERNMENT TO MAINTAIN INSPECTION.

On account, then, of the importance to the whole northwest, of restrictive measures at Port Huron and Detroit, in times of danger from contagious diseases, the State Board of Health has considered it the duty of the National government to carry on an inspection service at those places. It is not just to ask Michigan to defray the expenses of such inspection when she is no more benefited by it than is Wisconsin or Minnesota. The National government acknowledged the truth of that assertion when, in 1882, the National Board of Health maintained an inspection service at Port Huron and Detroit. As early as March 23, 1885, this Board, through its president and secretary, addressed the President of the United States as follows:

"The Michigan State Board of Health respectfully and earnestly petitions the President of the United States to immediately convene the National Board of Health, and authorize its use of so much of the Epidemic Contingent Fund as may be necessary for the carrying out of a vigorous system of measures for the prevention of the introduction and spread of dangerous communicable diseases, particularly of cholera."

The following letter will also serve to show the position taken by the Michigan State Board of Health in regard to this question:

MICHIGAN STATE BOARD OF HEALTH,
Office of the Secretary, Lansing, Michigan, Sept. 24, 1885.

Hon. RUSSELL A. ALGER, *Governor of Michigan, Detroit, Mich.:*

DEAR SIR:—At a special meeting of the State Board of Health, held in Lansing, Sept. 22, 1885, for the purpose of considering the subject of inspection of immigrants and travelers, it was

Resolved, That it is the unanimous opinion of the members present, that, inasmuch as the large majority of immigrants do not remain in this State, but are destined to points in the Northwest, it is, therefore, the duty of the general government to provide a large portion of the expense of these inspections; and we respectfully request your Excellency to make strenuous efforts to secure this aid from the general government.

Yet, as the service is imperative, in view of the great danger of the introduction of small-pox from Canada at the present time, it is necessary to continue the inspection, even if entirely at the expense of this State.

Very respectfully,
HENRY B. BAKER, *Secretary.*

The view of the duty of the National government, expressed in the above letter, is sustained by Dr. Irving A. Watson, secretary of the New Hampshire State Board of Health, and secretary of the American Public Health Association. Early in September, 1885, he attended a meeting in Montreal, of railroad officials and others, who were assembled to study the situation in Montreal and vicinity, and the best means of preventing the spread of small-pox into the other provinces and the United States. On his return, he addressed a long communication to the National Board of Health, of which the following are the closing paragraphs:

"While we were present at the meeting above mentioned, by invitation, and not authoritatively, we took the opportunity to investigate as thoroughly as possible the exact state of affairs; and it is our opinion that the Canadian authorities cannot handle the epidemic within their own borders, much less serve us in any marked degree in keeping the disease out of the New England States.

"As inter-State and inter-National commerce can only be regulated by the National Government, we believe it to be the duty of the latter to take immediate action in the matter."

NECESSITY FOR AN INSPECTION AGAINST SMALL-POX.

In regard to the necessity of establishing and maintaining, in 1885, an inspection service, to protect Michigan against the introduction of small-pox from Montreal, the following is quoted from a letter by Dr. H. R. Mills, of Port Huron, dated Aug. 19, 1885:

"Your favor of the 17th inst. is received. I have taken some pains to inform myself as to the number of immigrants arriving at this port at the present time. There are four trains arriving daily from the east: two from Montreal and two from New York, via Buffalo. Each train brings anywhere from a half a dozen to two or three cars full—about forty in a car. Just at the present time, however, travel is very light. But in a few days will begin the fall immigration from about Montreal and the lower provinces. This will continue until well into the winter. The customs officers on duty here are very anxious to have the inspection and disinfection begin at once. I had a short talk with the superintendent of this locality to-day. He says he can see no necessity for detaining immigrants or their effects under the present circumstances, but that he would of course comply with any order received from General Manager Hickson at Montreal. In order to do anything effectually, a complete understanding with him must necessarily be had. The inspection should begin, at the longest, as early as September 1, and as much earlier as possible."

On August 20, Dr. Mills telegraphed as follows: "Immigration from about Montreal increasing rapidly. Several carloads this morning."

Dr. O. W. Wight, health officer of Detroit, wrote to this office on August 19, 1885, as follows:

"In my judgment, you should ask from the fund, put at the disposal of the President by congress, last winter, enough to pay two inspectors on the branch of the Grand Trunk coming directly to Detroit, and two on the Grand Trunk at Port Huron, until such time as the fund put at the disposal of the Governor, by the law of last winter, takes effect on Sept. 18. I regard it important to have the four inspectors—two at Detroit, two at Port Huron—appointed without delay."

INSPECTION AGAINST SMALL-POX BY UNITED STATES MARINE-HOSPITAL SERVICE.

The danger of the introduction of small-pox into Michigan from Montreal seemed to be so great by the middle of August, 1885, that Governor Alger is reported to have telegraphed a notice of the situation to the Secretary of State, at Washington, who passed the telegram over to the Secretary of the Treasury, and he to Surgeon-General Hamilton, of the United States Marine Hospital Service. Dr. Henry W. Sawtelle, of the Marine Hospital Service, at Detroit, telegraphed to this office as follows: "Will two inspectors for Grand Trunk, Port Huron, and two for Canada Central, Detroit, be sufficient for protection of State from small-pox?" Pending the consideration of this question by members of the State Board of Health, the secretary replied that, in his opinion, two inspectors at Port Huron and two at Detroit, if acting in accordance with clearly defined ideas of what was needed, would serve a useful purpose in guarding against the introduction of communicable diseases.

The U. S. Marine Hospital established August 25 a train-inspection service[*] at Port Huron and Detroit, and agreed to sustain it until the law placing the contingent appropriation of $10,000 at the disposal of the Governor, should go into effect, September 18, 1885. As inspectors, the following were appointed: Port Huron, Hiram R. Mills, M. D., and Myron Northup, M. D.; Detroit, John J. Mulheron, M. D., and Fitz Hugh Edwards, M. D. Doctors Mills and Mulheron were both experienced in such inspection work, they having served as inspectors at Port Huron and Detroit while the National Board of Health, coöperating with the Michigan Board, maintained the inspection at those points.

According to their instructions the inspectors sent copies of their reports to the office of the State Board of Health. The following is a consolidated report of the work done by the inspectors at Port Huron from August 25 to September 18, inclusive.

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[*] *Regulations for the guidance of Inspectors appointed to prevent the introduction of small-pox and other communicable diseases into the State of Michigan from Canada.*

1. All persons arriving from Canada by rail or otherwise must be examined by a Medical Inspector before they will be allowed to enter the State of Michigan.
2. All persons coming from infected districts, not giving satisfactory evidence of protection against small-pox, will be prohibited from landing in the State until after a period of ten days.
3. All baggage, clothing and other effects coming from infected districts will not be permitted to enter this State without satisfactory evidence of having been properly disinfected.
4. Inspectors will act in conjunction with railway and customs officials and consult with State and local health authorities, as may be necessary; and all possible efforts will be made to prevent any unnecessary detention of trains, persons or baggage, consistent with the prevention of the introduction of communicable diseases, dangerous to the public health, into the State of Michigan.
5. Inspectors will at once notify the proper railway authorities in regard to these regulations, and ask their coöperation in carrying out the same.
6. Inspectors will make full weekly reports of services performed, and transmit to local boards of health and to the Michigan State Board of Health such reports as may be desired, and also make such special reports from time to time as may be deemed of interest to the service.
7. These regulations will become operative at once subject to modification at any time by proper authority.

TABLE 1.—*Inspections performed by U. S. Marine Hospital Service at Port Huron, Mich., from Aug. 25 to Sept. 18, 1885, exhibiting the number of trains and travelers inspected, the number of vaccinations performed, and the number of pieces of baggage fumigated.*

Time.	Trains inspected.	Travelers inspected.	Vaccinations performed.	Pieces of baggage fumigated.
August 25 to 29	20	1,600	3	59
Week ending September 5	28	3,868	10	110
Week ending September 12	28	1,382	9	46
September 12 to 18	24	1,883	13	73
Total	100	8,733	35	288

Table 2 is a statement of the work done under this inspection at Detroit from Sept. 7 to Sept. 18 inclusive. The work was commenced Aug. 25, as at Port Huron; but the reports up to Sept. 7, made by the inspectors, give no statistical data.

Table 3 exhibits the totals of Table 1 and Table 2, on this page. It shows the work done by the service at Port Huron from Aug. 25 to Sept. 18 inclusive, and at Detroit from Sept. 7 to Sept. 18 inclusive.

TABLE 2.—*Inspections performed by the U. S. Marine Hospital Service at Detroit, Mich., from Sept. 7 to Sept. 18, 1885, giving the number of trains and travelers inspected; the number of vaccinations performed: the number of passes accepted, holders being found protected; and those revoked, holders not being protected: and the number of pieces of baggage fumigated.*

Time.	Trains inspected.	Travelers inspected.	Vaccinations performed.	Passes.		Pieces of baggage fumigated.
				Accepted, holders found protected.	Revoked, not found protected.	
September 7 to September 14	35	3,928	11	0	0	18
September 14 to September 18	20	1,796	11	3	5	30
Total	55	5,724	22	3	5	48

TABLE 3.—*Inspections performed by the U. S. Marine Hospital Service at Port Huron (Aug. 25 to Sept. 18) and Detroit (Sept. 7 to Sept. 18), exhibiting the number of trains and travelers inspected; the number of vaccinations performed: the number of passes accepted, holders being found protected; and those revoked, holders not being found protected; and the number of pieces of baggage fumigated.*

Place of Inspection.	Trains inspected.	Travelers inspected.	Vaccinations performed.	Passes.		Pieces of baggage fumigated.
				Accepted, holders found protected.	Revoked, not found protected.	
Port Huron	100	8,733	35	....	....	288
Detroit	55	5,724	22	3	5	48
Total	155	14,457	57	3	5	336

The following report from the inspectors at Port Huron is of especial interest because it exhibits the actual procedure in one day's inspection of trains as a sample of their daily work:

PORT HURON, MICH., *September 12, 1885.*

Dr. H. W. Sawtelle, Surgeon U. S. Marine Hospital Service, in charge of inspection service, Detroit, Mich.:

SIR—We have the honor to forward herewith the report of the inspection service at this port, for the week ending Saturday, September 12, 1885. In order to give you an idea of the work being done beyond what is shown in the tabular report, we beg leave to submit the details of a single day.

At 5 o'clock each morning an inspector goes to the station at Fort Gratiot and takes the ferry to Point Edwards to meet train No. 2, Grand Trunk Railroad, direct from Montreal, which arrives at 6 A. M. when on time. The train is held until all the tickets of passengers are examined, for the purpose of learning the starting point of each person. When any one is found with a ticket from Montreal, or within a radius of 50 miles from that place, or from any other suspected locality, the party is at once questioned as to the amount of time spent in that place, whether residents or transients, or coming directly through, simply buying tickets and changing cars at Montreal, or if the party has spent any time in the infected region. The baggage is marked for fumigation and the owners requested to get out on the platform and take everything belonging to them with them and claim their baggage at the baggage car. At the same time the number of the checks are taken and reported to the baggageman, who has the designated pieces ready for delivery. These trunks are placed on trucks by the train men, also any unchecked hand-luggage, and taken by them to the fumigating car, accompanied by the owners. Everything is then placed in the car and each piece opened by its owner and spread out on the lines running from one end of the car to the other. No persons enter the car except the train men and owners of the property to be fumigated. Three pounds of sulphur to 1,000 cubic feet of air space are put in an iron pot and ignited in the car, which is then closed and locked. The usual time allowed for fumigation is from one to three hours. When the clothing is thoroughly unpacked it is thought that one hour is sufficient, but when there is ample time it is allowed to remain longer in the fumigator. During the fumigation of the baggage the opportunity is taken to examine the owners as to their protection against small-pox. When found unprotected they are vaccinated. If any persons refuse to be vaccinated, they are not allowed to pass into the State until after a period of ten days. So far, however, no one has refused vaccination.

The inspecting officer next meets train No. 1, which arrives from Niagara Falls usually at 7.30 in the morning, and repeats the programme carried out with train No. 2. Those passengers who have been detained from No. 2, if ready, are allowed to depart on this train. In this manner those going to Chicago make the same connections which they would have made had they not been detained. The next regular train to be inspected, No. 4, arrives at Point Edwards at about 4 P. M., but in order to avoid detaining it after arrival, the inspector is obliged to take the east bound train at Port Huron or Fort Gratiot at 11 A. M. By this means it is met at Lucan, 54 miles east of Point Edwards. This is usually a heavy train, coming direct from Montreal, and requires close attention. The same course is adopted by the inspector as with No. 2 in the morning. The inspected passengérs and baggage are marked, removed from the train at Point Edwards, where the process of fumigation is repeated. Train No. 57 from Niagara Falls arrives at Point Edwards at about 8 P. M., and is treated in the same manner as described above.

In addition to the above-mentioned regular trains, arrivals by special trains and by boat are liable to require attention not unfrequently. Thus far the work has been prosecuted with but little dissatisfaction on the part of the traveling public. Most people seem to understand the necessity of stringent measures and comply with the requirements quite complacently. The railway and United States customs officials continue to render every assistance in their power.

Very respectfully,

(Signed) H. R. MILLS,
M. NORTHUP,
Inspectors.

The reports from the inspectors at Detroit, for the weeks ending August 30 and September 7, are given in full:—

Henry W. Sawtelle, Esq., M. D., Surgeon U. S. M. H. Service, Detroit, Michigan:

The undersigned, Sanitary Inspectors at Detroit, Michigan, appointed by you, under the authority of the U. S. Marine Hospital Service, herewith submit a report of their services for the week ending August 30, inst.:

Your inspectors, on receiving their appointment, on the 24th inst., took immediate occasion to confer with you and Dr. O. W. Wight, Health Officer of Detroit, from whom they received very concise and explicit printed instructions, which were at the time, and have since been, supplemented by valuable verbal suggestions, covering the duties devolving on them. Your judicious course in causing copies of our printed instructions to be placed in possession of the railroad authorities and U. S. customs officials, has very much facilitated the performance of our duties. On being apprised, through the receipt of these instructions, of the appointment and duties of the sanitary inspectors at this point, the general superintendent of the Grand Trunk railroad, of Canada, promptly issued a circular to the train men, in which they were enjoined to act in conjunction with your inspectors in carrying out the letter and spirit of your instructions. The Grand Trunk railroad officials at Detroit and Windsor have also provided suitable rooms for the disinfection of clothing and baggage, as required in your printed instructions, and Dr. O. W. Wight has placed at the disposal of the service all necessary disinfectants.

It was originally intended that your Inspectors should meet the incoming trains at certain points, as Chatham and Essex Center, at some distance in the interior of Ontario, and thus conduct the inspection service before the arrival of the trains at Windsor. This has, however, been demonstrated by experience to be quite impracticable, owing to the impossibility of making the necessary railway connections. Your Inspectors have, therefore, been obliged to board the trains on their arrival at Windsor, opposite Detroit, at which point there is a sufficient delay, due to the transfer of the trains to the railroad ferries, to permit of the necessary inspection before their arrival on this side the line.

The inspection has thus far been confined to the trains coming over the line of the Great Western railroad division of the Grand Trunk railroad, the irregularity of the arrival of the trains and the correspondence in the hours of the arrival of the trains on this line with those of the arrival of the trains coming in on the Canada Southern division of the Michigan Central railroad, making it impossible for your Inspectors to attend to the latter. An additional inspector will be necessary to secure the inspection of all the incoming trains. The irregularity in the arrival of the trains necessitates the waste of a very considerable amount of time, over thirteen hours having been consumed on one day during the past week in the discharge of your Inspectors' duties.

On the arrival on the Great Western railroad, through trains at Windsor, numbering three each day, at 8:35 A. M., 1:05 P. M. and 8:50 P. M. respectively, your Inspectors first consult the conductors, who assist them in discovering the passengers coming from infected districts. Your Inspectors thereupon carefully examine such passengers, and question them touching their possible contamination with small-pox contagion. In suspicious cases the baggage is subjected to fumigation with burning sulphur in the room provided for that purpose; and in the absence of proper evidence of protection by vaccination, the parties are subjected to the operation.

The only suspected case occurring prior to the securing of the proper facilities for disinfection, was that of an Indian, named Zimmie Mury, who was ticketed through to Arkansas City. This passenger complained of the prodomal symptoms of small-pox, the eruption not having appeared. He was vaccinated by your Inspectors, and the case was promptly reported to Dr. O. W. Wight, the health officer of Detroit, who telegraphed to Arkansas City, notifying the authorities of his prospective arrival and suggesting the necessary attention in the premises.

Your Inspectors are under many obligations to the local health authorities, the railroad employés and the U. S. customs officials, for their intelligent and cordial coöperation in facilitating the work of inspection.

Respectfully submitted,

(Signed) J. J. MULHERON,
FITZ HUGH EDWARDS.

DETROIT, Aug. 31, 1885.

Dr. Henry W. Sawtelle, Surgeon U. S. M. H. Service, Detroit, Mich.:

The undersigned sanitary inspectors beg to submit herewith a report of our service for the week ending September 7th, inst.

The number of trains inspected was twenty-one regular trains and one special, arriving over the Great Western railroad division of the Grand Trunk railroad, and two regular trains arriving over the line of the Canada Southern. The regular trains on the Great Western railroad averaged 5 11-21 cars each, and the average number of passengers per car was 19¾. The number of pieces of baggage discovered as having come from the small-pox infected district (Montreal) was five. Those pieces consisted of trunks and valises, which were opened and subjected to the fumes of burning sulphur in the room provided for that purpose. The number of vaccinations performed was 19. Of this number eight were of railway employés, and eleven of passengers coming from infected districts.

We have to report a marked falling off in the number of Montreal passengers arriving over the Great Western railroad during the past week. This having been supposed to be due, in a measure, to the fact of our inspection of the trains arriving by this road, and the non-subjection of passengers arriving over the Canada Southern to the inconvenience of inspection, owing to our inability to attend to the latter, we made two visits to trains coming in by that line to discover whether a greater number of Montreal passengers came by that route. We found that the 5.50 and 8.45 P. M. trains make direct connection at St. Thomas, with the Canada Pacific arriving from Montreal, and that a greater number of passengers are thus brought directly through from the infected district than arrive over the Great Western railroad. We had previously reported our inability, with reasons therefor, to inspect the trains arriving over both of these roads, and called attention to the urgent necessity of additional inspectors for the purpose. It gives us pleasure now to announce that Dr. O. W. Wight, health officer, of Detroit, has furnished us with the necessary assistance, in the person of Dr. F. W. Owen, and that in our next report we shall be able to include a detail of work done on all the trains carrying passengers to this point from infected districts.

The special train referred to as having been inspected by us, was that carrying the "Buffalo Bill" company of Indians, cow-boys and stock. It consisted of 18 cars, and arrived at 2:45 o'clock on the morning of the 4th inst. The company had performed in Montreal three weeks previously, and had during the interim been performing at various points in Ontario. On the day previous to its arrival here it had performed at St. Thomas, whence it came provided with a certificate of health from E. W. Gustin, M. D., Surgeon Grand Trunk railroad, who had examined it prior to departure. This certificate was countersigned by Allan Francis, U. S. Consul at St. Thomas. The train was detained at Windsor until daylight, when we made an examination of every member of the company, finding all to be in good health and their baggage in good sanitary condition.

Respectfully submitted,

J. J. MULHERON,
FITZ HUGH EDWARDS,

DETROIT, MICH., Sept. 8, 1885.

NECESSITY OF CONTINUING THE INSPECTION AFTER SEPTEMBER 18.

As the time drew near when the State Board of Health would have funds with which to carry on the inspection service, it became a subject of inquiry whether there was any necessity of continuing the work. No outbreak of small-pox had occurred in Michigan since the outbreak at Montreal in the spring; and although the epidemic in that city was daily becoming more destructive, our exemption from its attack thus far had raised in some minds a feeling of security and a willingness to trust wholly to good luck for escaping a visitation of the disease. It was the opinion of the members of this Board that the inspection should go on. It was impossible to tell what value the inspection service had been in keeping out small-pox from Michigan; but it is fair to presume that it prevented outbreaks in Michigan and in other States. The degree of immunity from small-pox which it secured to the whole Northwest cannot be measured, or in any considerable degree indicated, by the actual number of cases of small-pox discovered by the inspectors and detained and isolated by them; because persons actually sick with small-pox are not so likely to travel and spread the disease as are those not sick but who come from infected places with infected clothing, baggage, etc. The number of immigrants from infected places, that were vaccinated; the number of such immigrants examined; and the number of pieces of suspected baggage that were disinfected, supply a much better test of the value of an inspection service. In a letter dated October 7, 1885, Dr. T. S. Covernton, Chief Medical Inspector at Montreal, the secretary of this Board, said:

> "The experience in past years has shown that in Michigan the danger of the introduction of small-pox is greatest from infected material, and persons exposed to the disease who have not yet contracted it, and those who have contracted it but in whom the disease has not yet appeared. * * * Our inspectors search for any evidence of the disease (which might arise after examination at Montreal), but they also give great attention to the disinfection of baggage likely to be infected, and this part of their work is probably the most useful in preventing the introduction of small-pox."

It is, of course, impossible to assert that if a French-Canadian fresh from Montreal were not vaccinated, and his baggage subjected to a fumigation, that he would be the means of spreading small-pox; but at the same time there can be no doubt that so long as the immigration and the epidemic continued, it was the part of wisdom to take such reasonable precautions. These precautions would not make the State absolutely free from danger;

but they seemed to be the least that should be done in the emergency. Another consideration that had weight was the increased danger to Michigan arising from the influx, expected annually in the fall, of French-Canadians from about Montreal to the lumbering camps of our State. This influx was sure to begin soon, and the danger was thought to be very grave by those who knew the character and habits of these men, and the numbers in which they flocked to the lumber woods of Michigan. The following letter from Dr. O. W. Wight, health officer of Detroit, is interesting in this connection:

CITY OF DETROIT, HEALTH OFFICE,
September 14, 1885.

Henry B. Baker, M.D., Sec. State Board of Health, Lansing, Mich.,

DEAR DOCTOR,—Yours of the 12th just received. You ask: "How long, in your opinion, should an inspection last *under such circumstances?*" The circumstances alluded to are a newspaper declaration, attributed to me, that "no suspected cases have come under the observation of the physicians since the last report."

It is true, and not questioned, that there are more than 1,000 cases of small-pox in Montreal; that in the autumn mechanics habitually come from that city and vicinity to Michigan towns, and laborers to our lumber districts, seeking employment at low wages; that there is very great danger that such persons may bring disease, especially in their baggage, if the ways of travel are left unguarded. It is true that the timely establishment of sanitary inspection on railroads leading from Montreal to Michigan have discouraged and for the time being suppressed the movement of such people. It is also true that such sanitary inspection, threatening to throw back onto the border towns of Ontario any infected persons, have induced that province to institute inspection of trains coming from Montreal as a measure of self-protection.

The conclusion that because our inspection, and the Ontario inspection growing out of it, are so effective as to prevent all infected persons from an attempt to run the double gauntlet, therefore inspection is useless, would add new lustre to the renown of the immortal Dogberry.

Several hundred disinfections of suspected personal effects have been made by the inspectors. To discontinue our inspection would encourage the Ontario sanitary authorities to do the same. The result of which would be to make Michigan the dumping ground of considerable Montreal infection. As cold weather comes on,small-pox will flourish more abundantly, and to discontinue an inspection service, upon the ground that it has been so effective as to keep back all dangerous travel, would not only be sanitary madness but also immeasurable sanitary stupidity.

Four years ago sparks of small-pox were lodged at 37 points in Detroit from the conflagration in other cities, mostly Chicago, and I don't want the experience repeated from Montreal. The fire was quenched without spread at all the 37 points, but the experiment is too dangerous to repeat, especially when the expenditure of a few hundred dollars promises to keep it entirely away. Detroit is not the only exposed place in Michigan, and has a right to call upon the State to share the expense of prevention.

Respectfully,

O. W. WIGHT, M. D., Health Officer.

INSPECTION SERVICE SUPERVISED BY THE MICHIGAN STATE BOARD OF HEALTH.

Act No. 230, laws of Michigan, 1885 (printed on page 197), went into effect September 18, 1885, and the State Board of Health was thus empowered, with the approval of the Governor, to take charge of the inspection service. Governor Alger signified his desire to have this done; and the Board held a special meeting on September 22, for the purpose of adopting rules and transacting other necessary business connected with the work. The inspectors appointed by the Marine Hospital Service continued their work from September 18 to September 22 inclusive, trusting to the Board to pay them for the same. The Board reäppointed the old inspectors, and added Dr. F. W. Owen of Detroit to the number.

The Board adopted the following rules for the government of the "Health inspection of immigrants and travelers, for the prevention of the introduction and spread of cholera, small-pox, and other dangerous communicable diseases:"—

Rules Made and Published by the Michigan State Board of Health; under Act No. 230, Laws of Michigan, 1885,—(in Effect from and after Sept. 18, 1885.)

[95.]

1. All immigrants or other persons arriving at Detroit and at Port Huron, or at any other point in the State of Michigan, from Ontario, or by any other route from a locality liable to be infected with cholera, small-pox, or other dangerous communicable disease, shall be subject to inspection by an officer appointed by the Michigan State Board of Health.

Instructions to Health Inspectors of Travel, Michigan State Board of Health.

2. Make, and keep a record of every official action by you or by your order.

3. Confer with the local health authorities, and provide, or know where you can at short notice secure a room or rooms to which suspected cases may be taken.

4. Provide disinfectants and all necessary apparatus wherewith to immediately disinfect a car or a room at short notice.

5. Provide a small room in which to disinfect your own clothing, and any other article which may need disinfection.

6. Know just where nurses can be had at short notice.

7. Know just where a physician can be had at short notice.

NOTE.—You are not authorized to incur expense to the State for a physician, nurse, or for any care for a sick person.

8. In your records, specify each boat or vessel by name, and each train by number and the hour of day, and every conveyance or vehicle, in such way as to positively identify each in connection with all other records made by you, relative to passengers on each train, boat, or vehicle.

9. Confer with the railway and transportation officers, and ask their coöperation in this inspection

10. Relative to each train, boat, or vehicle, learn the place from where it started. Does it stop or change at your inspection station? If not, toward where does it proceed?

11. Note and record the time and actual place of inspection.

12. Note and record the name of the conductor or captain.

13. From where are the immigrants or passengers?

14. Ascertain the destination of the immigrants or travelers so far as is practicable.

15. Report to the Secretary of the State Board of Health the name and destination of any person suspected of conveying or harboring a dangerous communicable disease.

16. Proceed regularly through each boat or vessel, and each car of each train; examine each immigrant or passenger, and all baggage, etc.

17. Search for, and enquire for, any sickness, but with the view of detecting small-pox, cholera or other dangerous communicable disease.

18. In making this inspection, see that every effort is made to detect any sign or evidence of the presence of cholera, small-pox or other dangerous communicable disease, in person, baggage, or other substance.

NOTE.—An idea of the importance of being on the lookout for scarlet fever and diphtheria may be gathered from the fact that, in Michigan, in a long series of years, the deaths reported from scarlet fever are eight times as many, and from diphtheria sixteen times as many, as from small-pox.

*19. You are authorized by law (Sec. 2, Act No. 230, Laws of 1885) to administer an oath, whenever you may need to do so, in order to learn the truth concerning the "place from which the suspected person, baggage, or freight came, the time elapsed since his or its exposure to cholera or other dangerous disease, and on other subjects on which information is needed."

*20. If immigrants or travelers are met with, from any place, vessel, train, or vehicle, believed to be infected with cholera, small-pox, or other dangerous communicable disease, be especially careful to question, on oath, (unless you deem that, in order to most rapidly learn the truth, the oath is not at first advisable) as to the points specified in the law, and sufficiently to determine whether there is reason to think them liable to introduce by their own persons, baggage, or effects, cholera, small-pox, or other dangerous communicable disease.

21. If baggage is found, from any place, vessel, train, or vehicle, believed to be infected with cholera, small-pox, or other dangerous communicable disease, be especially careful to question (on oath, if advisable) any and all persons liable to know the facts.

*22. All bedding, wearing apparel, or bundles, or other articles liable to be the hiding place of contagion, arriving from suspected places, must be unpacked and thoroughly disinfected before being allowed to proceed. Disinfection of such substances shall be by sulphur fumigation,—three pounds of sulpur burned to each one thousand cubic feet of air-space; and as per directions in circular No. [92], issued by the Michigan State Board of Health.

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* Afterwards made to apply to freight cars and freight from infected places; also to freight arriving by steamer or other vessels. See "Condensed Rules," page 212.

23. Clothing may be disinfected in cars fitted for that purpose *en route* when practicable, or at such places as the interests of all concerned may make it necessary.

24. In typhoid fever, isolation of the patient is not required, but disinfection of all discharges, especially those from the bowels is important, and should be done by methods described in circular No. [92], Michigan State Board of Health.

25. Be prepared to supply on short notice, inexpensive outer clothing to enable you to disinfect the clothing worn by one or two carloads of persons of both sexes.

26. Be prepared to provide shelter in cars, rooms, or tents, for persons detained during disinfection of their clothing, or for any other purpose.

27. Upon discovery of evidence of cholera, small-pox, or of other dangerous communicable disease, sufficient to warrant isolation or detention, or both, of any person or material, inform the conductor or captain of the fact, and at once establish a suitable isolation of the infected person or article; thoroughly disinfect the clothing of all occupants of the car or boat, and see that the car or boat is properly cleaned and disinfected. If the disease is small-pox, vaccinate with bovine virus all unprotected persons who have been exposed to the contagion; and turn back all unprotected persons who refuse to be vaccinated.

28. If a case of *suspected* dangerous communicable disease is found, isolate it and report, also report the same to the local board of health having jurisdiction.

29. Isolation for railway passengers may be established in cars devoted to that purpose, or in an emergency, at such stations as the inspector may designate.

30. Notify, at once, the Secretary of the State Board of Health, of the discovery of any dangerous communicable disease in a person, and of any infected substance, and the action you will take, or have taken.

31. Notify any local health officer of the discovery of any dangerous communicable disease in his jurisdiction, and the action already taken, and of what is needed to be done; also, of the prospective entry within his jurisdiction of any infected person or article.

32. Each inspecting officer will report promptly to the Secretary of the State Board of Health, at Lansing, any important information he may gain, which may be useful in aiding the Secretary, or the State Board of Health, better to guard the health interests of the people of Michigan; or any such information which should be transmitted to places in Michigan or to other States. In case you have also notified local health officers, add that informatiou in order to save duplicating the expense.

33. Examine all immigrants and all suspected travelers minutely, as to their protection against small-pox; and any such person who has not been vaccinated successfully within five years, or has not had small-pox within that time, should be vaccinated, unless exempted on account of pregnancy, ill health, or some other good and sufficient reason. Any person found protected will receive a white card signifying the fact, signed by the inspector. Any person whom the inspector may vaccinate will receive a red card as a certificate of vaccination. Any unprotected person whom the inspector may not vaccinate for reasons as above, will receive a blue card showing reason of exemption. All of these cards will be dated and signed by the inspector.

34. All cars or vessels arriving or departing in an unsanitary condition shall be reported to the State Board of Health, and also to the proper railroad officials.

35. The quality of the ice and water-supply shall receive the closest scrutiny of the inspecting officers; and when found of a dangerous or poor quality, or from a source making it liable to communicate a dangerous disease, the fact will be promptly reported, and measures taken for improvement.

36. Each inspecting officer will make a weekly report to the Secretary of the State Board of Health, at Lansing; and such special reports as occasion may require, or as may be requested.

37. The weekly report to the Secretary of the State Board of Health, to be made on blanks supplied from the office of the Secretary, shall include statements as follows:

a. The number of trains inspected each day.

b. The number of cars inspected each day.

c. The number of passengers on each train or boat.

d. The number of passengers inspected on each train or boat.

e. The number of each nationality of those inspected.

f. The number of persons vaccinated under five years of age.

g. The number of persons vaccinated over five years of age.

h. The number of pieces of baggage fumigated.—Canadian, transatlantic.

i. If from across the sea, the name of the place at which they embarked; the name of the vessel in which they sailed; the place of debarkation, and where they took the cars in coming to this place.

j. The destination of each so far as it can be ascertained, and the route taken in leaving the place of inspection.

k. The sanitary condition of the people, and of the cars, boats, etc., in which they arrive.

l. Such other items of information as may be called for by the blank, or as the inspector may think important to be put on record.

38. Changes in the above and additional rules, may be made by this Board, if experience develops the necessity.

39. Whoever violates these rules by interfering with the proper performance of duties under them by inspectors appointed by the State Board of Health, or otherwise, is guilty of, and should be punished as in case of misdemeanor. See Sec. 3, Act No. 230, Laws of 1885, under which these rules are made.

At the special meeting of the State Board of Health, held at Lansing, Michigan, September 22, 1885, the foregoing rules were adopted as the authorized rules governing the inspection service of the State of Michigan, under Act No. 230, Laws of 1885. In accordance with Section 3, of that Act, they are hereby published.

By direction of the State Board of Health.

HENRY B. BAKER,
Secretary.

Inspection of Immigrants at Port Huron from Sept. 19 to Oct. 24, 1885.

From September 19 to October 24 inclusive the total number of immigrants and other travelers examined at Port Huron were 12,282. Of these 449 were from suspected places; 288 persons were vaccinated, of whom 37 were children under 5 years of age. There were 487 persons detained; and 513 pieces of baggage, together with the clothing of 6 persons, were fumigated. There were 363 passes accepted in lieu of vaccination or detention.

On October 9 Dr. Northup discovered a child convalescing from small-pox. The child and accompanying family were detained, their clothing fumigated, and their bodies washed.

It would be reasonable to suppose that a vigorous inspection at a station like Port Huron would effect a reduction in the per cent. of immigrants who would come unprotected against small-pox. Those having been subjected to the inspection would, in writing back to their acquaintances, caution them not to come unprotected. If exposed to the disease, they would be influenced to wait until certain that they were free from contagium before embarking. Those not exposed would properly protect themselves before immigrating. Also this inspection service prompts inspection service on the steamship lines which have their termini at Quebec and Montreal, and, also, inspection service at these places of debarkation. This supposition would seem to be warranted by the result of the inspection thus far made. The inspection by the National Board of Health, ending September 30, 1882, resulted in the examination of 17,909 persons, 7,993 of whom were unprotected and were vaccinated by the inspectors; the inspection ending May 31, 1883, examined 52,701 persons, and of this number vaccinated 19,811; and the inspection ending October 24, 1885, examined 12,164, and vaccinated 252. Thus during the first inspection there were 45 per cent. of vaccinations performed; during the second 38 per cent. were vaccinated, and during the third there were 2 per cent. vaccinated. This result of inspection though somewhat remote is beneficent. The immediate result is still more important. During the small-pox epidemic of 1885 in the province of Quebec and in Ontario, although Michigan was more exposed by influx from the infected districts than any other state, yet while small-pox spread into 9 different states, there is reported not a single outbreak in the state of Michigan.

TABLE 4.—*By weeks, from Sept. 19 to Oct. 24, 1885, inclusive, the number of trains, boats, and travelers inspected at Port Huron, Mich., the number of immigrants inspected from suspected places, the number of vaccinations performed under 5 years of age, 5 years old and over, and in total; passes accepted and those revoked, persons detained; persons whose clothes were fumigated, and the number of pieces of baggage fumigated.*

Week ending Saturday,—	Trains and boats inspected.	Whole number of travelers.		Vaccinations performed.			** Passes examined.		Persons detained.	Persons whose clothes were fumigated.	Pieces of baggage fumigated.
		Inspected.	Inspected from suspected places.	5 years old and over.	Under 5 years old.	Total vaccinations performed.	Accepted; holders found protected.	Revoked; holders found not protected.			
September 19	4	218	......	......	......	......	......	......	10	......	12
September 26	29	4,388	......	......	......	13	......	......	117	......	112
October 3	28	2,095	......	......	......	21	......	......	81	......	91
October 10	26	* 1,731	75	22	8	30	8	0	56	¶ 6	65
October 17	26	† 1,815	‡ 153	67	8	75	119	3	131	......	117
October 24	41	§ 1,917	311	96	17	113	233	0	82	......	108
Total	154	‖ 12,164	539	185	33	252	360	3	477	6	505

* One inspector reporting 1,142 of this number, estimates four-fifths to be Americans and English Canadians, one-tenth French Canadians, and one-tenth Germans, Irish, and English; those from across the sea embarking as follows: S. S. Geiser, Christiana; S. S. Main, Bremen; S. S. Germania, Queenstown; S. S. Westernland, Antwerp; S. S. Polynesia, Bremen; S. S. Adriatic, Liverpool; and all debarking at New York; also the Polynesia from Liverpool to Quebec. Immigrants were destined for points northwest, west, and southwest.

† Of this number 1,053 are estimated as followed: English speaking people from the United States and Canada, four-fifths; French Canadians, one-tenth; Scandinavians, Germans, foreign English and Irish, one-tenth.

‡ Seventy-two of this number are reported nearly all French-Canadians.

‖ Destination, Michigan, Chicago, and the west, northwest, and southwest. Routes, Chicago and Grand Trunk and Port Huron and North Western Railways.

§ Of this number 653 are reported as follows: From the United States, five-eighths; Canadians, one-fourth; one-eighth foreign English, Italians, Irish, Germans, and Swedes. The latter eighth embarked from Hamburg, Bremen, Christiana, and Londonderry on board S. S. Russia, S. S. Sardinia, and S. S. Elder; 433 were Canadians, mostly French; 831 were four-fifths English speaking Canadians and Americans or English; one-fifth French Canadians, Germans, and Scandinavians. Those from across the sea embarked from Bremen and Liverpool on S. S. Donau and S. S. Ems, and debarked at New York City.

¶ A case of convalescing small-pox is included in this number.

** Certificates of protection against small-pox by virtue of vaccination or having previously had small-pox.

Inspection of Immigrants at Detroit, Sept. 19 to Oct. 24, 1885.

From September 18 to October 24 inclusive the total number of immigrants and other travelers examined at Detroit was 10,174. Of these, 413 were from suspected places, and 243 were vaccinated by the inspectors. Of the latter 28 were children under 5 years of age. There were 7 persons detained, and the clothing of 52 persons, together with 270 pieces of baggage, was fumigated; 277 passes were accepted in lieu of vaccination or detention, and 140 were revoked, the holders not being found protected.

Table 5.—*By weeks from Sept. 18 to Oct. 24, 1885, inclusive, the number of trains, boats, and travelers inspected at Detroit, Mich., the number of immigrants inspected from suspected places; the number of vaccinations performed on persons under 5 years, 5 years and over, and in total; passes accepted, holders being found protected; passes revoked, holders being found not protected; number of persons detained; number of persons whose clothes were fumigated; and the number of pieces of baggage fumigated.*

Week ending Saturday,—	Trains and boats inspected.	Whole Number of Travelers.		Vaccinations Performed.			Passes examined.[c]		Persons detained.	Persons whose clothes were fumigated.	Pieces of baggage fumigated.
		Inspected.	Inspected from suspected places.	5 years old and over.	Under 5 years old.	Total vaccinations performed.	Accepted; holders found protected.	Revoked; not found protected.			
September 19	4	*297	7	3	0	3	4	0	0	0	5
September 26	26	†2,164	62	44	3	47	24	16	0	0	49
October 3	25	‡2,002	65	27	7	34	33	28	0	0	43
October 10	25	§1,658	58	27	3	30	‖ 44	26	0	0	¶ 25
October 17	25	**1,486	90	48	5	53	33	35	0	0	58
October 24	32	††2,567	131	66	10	76	139	35	7	52	90
Total	137	[b]10,174	413	215	28	243	277	140	7	52	[a] 270

* Of this number 7 were French-Canadians, 268 Americans and English, and 22 were Polish immigrants.

† Of this number 1,538 were as follows: 12 English tourists, 34 French-Canadians, about 100 German and Polish immigrants, and the remainder English-speaking people. A few immigrants were destined for Michigan, and the rest for Chicago and the Northwest.

‡ Of these, 1,218 were as follows: 48 German immigrants, 32 French-Canadians, and the rest English-speaking people.

§ Of these, 1,076 were as follows: 18 Polish immigrants, 39 French-Canadians, and the rest English-speaking people. Immigrants were destined for Chicago.

‖ 12 of these were issued by surgeons of S. S. Main and S. S. Elba.

¶ One of this number was an unclaimed piece of baggage from Montreal.

** Of these, 18 are reported German immigrants, and 51 French-Canadians.

†† Among these were the following immigrants: 41 Germans, 35 from Bremen, a few from Scotland, 1 Italian, and 1 Chinese.

[a] Cars loaded with household goods from Montreal were held at Windsor and disinfected before being allowed to cross the river as follows: Oct. 16, 1 car; Oct. 19, 3 cars; Oct. 21, 3 cars; Oct. 22, 4 cars; and on Oct. 24, 4 cars.

[b] Dr. Mulheron, under date of Oct. 14, 1885, says: "I inspect each passenger, although all are not required to bare their arms."

[c] Cards certifying protection against small-pox.

Summary Statement of Immigrant-inspection at Port Huron and Detroit from September 18 to October 24, 1885.

The following table exhibits the combined summaries of Port Huron and Detroit inspection from Sept. 18 to Oct. 24, 1885, inclusive, from which it is seen that 22,456 persons were inspected. Of these 862 were from suspected places, 640 were vaccinated by the inspectors, and of these 65 were under 5 years of age. There were 494 persons detained. The clothing of 58 persons, together with 783 pieces of baggage, was fumigated.

TABLE 6.—*By weeks from Sept. 19, in Port Huron, and Sept. 18, in Detroit to Oct. 24, 1885, inclusive, the Number of Boats, Trains, and Travelers inspected, the Number of Immigrants inspected from Suspected Places, the Number of Vaccinations Performed on Persons under 5 years old, 5 years old and over, and in Total; Passes Accepted and those Revoked; Persons Detained: Persons whose Clothes were Fumigated, and the Number of Pieces of Baggage Fumigated.*

Place of Inspection.	Trains and boats inspected.	Whole number of travelers.		Vaccinations performed.			Passes examined.		Persons detained.	Persons whose clothes were fumigated.	Pieces of baggage fumigated.
		Inspected.	Inspected from Suspected Places.	Five years old and over.	Under five years old.	Total vaccinations performed.	Accepted; holders found protected.	Revoked; found not protected.			
Port Huron	154	12,164	539	185	33	252	360	3	477	6	505
Detroit	137	10,174	413	215	28	243	277	140	7	52	270
Total	291	22,338	952	400	61	495	637	143	484	58	775

Expense of Inspection Service from Sept. 18 to Oct. 24 Inclusive.

The expenses of the inspection service under the State Board of Health amount to $851.77, and the items are as follows:—

Expenses of members in attending special meeting of the Board	$36 00
Bovine vaccine virus points	42 37
Printing	5 40
Salaries of inspectors	768 00
Total	$851 77

It may become necessary to add $44.00 to this total. One inspector failed to make his reports as required by the rules of the Board, and his pay for the last eleven days of his term of service is withheld because he has not yet certified to the correctness of the account.

Each bill was thoroughly scrutinized by the secretary, and was signed by Governor Alger as well as by the president and secretary of the Board.

Expenses for the distribution of documents and other information to lumbermen and lumber camps are not included in the foregoing statement; that was a part of the work of the office of the Board—paid for out of its regular appropriation.

"*Condensed Rules.*"

At a meeting of the Board, October 13, 1885, the following "Condensed Rules Governing State Health Inspectors of Travel at Port Huron and Detroit, Michigan," were adopted:

1. All travelers and immigrants coming into Michigan from Ontario shall be subject to inspection by an officer appointed by the Michigan State Board of Health.
2. All baggage, household goods, and other effects, belonging to people moving into the United States or to suspected travelers, must be disinfected before entering the country.
3. All immigrants and suspected travelers who do not present proper evidence of recent vaccination or other immunity from small-pox must be vaccinated before entering the State.
4. After October 15, 1885, no passenger car coming from Montreal or other infected district shall be allowed to enter the State without being properly disinfected.

5. Freight and cars from Montreal or other place liable to be infected, consigned to any place in Michigan, must be thoroughly disinfected before being allowed to proceed. (See Rules 19, 22, and 31, Rules of this Board, under Act No. 230, Laws of 1885.) Inspectors are expected to notify health officers of places outside of Michigan to which are consigned freight cars from suspected places, if they are not disinfected because not consigned to this State.

Copies of these "Condensed Rules" were ordered sent to railroad officials in Michigan and Canada, and to such other persons as the secretary might deem best.

Appointment of New Inspectors.

At a meeting of the Board October 13, 1885, Dr. Mortimer Willson was appointed an inspector at Port Huron in addition to the two already appointed; and a committee chosen to select two additional inspectors for Detroit finally appointed Dr. A. B. Chapin and Dr. F. D. Hiesordt. These inspectors began their work October 19.

At this meeting alternate inspectors were provided for, to act in case of the inability of the regular inspectors. It was also provided that the pay of inspectors be four dollars per day; that they should be paid monthly, and that the president and secretary of the Board should certify to the same, and approve the accounts for payment.

Drs. Baker and Lyster were appointed a committee to arrange and supervise the inspections at Detroit and Port Huron, and were authorized to discharge those inspectors that could be best spared at any time a less number could do the work.

UNITED STATES MARINE HOSPITAL SERVICE AGAIN TAKES CONTROL.

The connection of the Michigan State Board of Health with the State health inspection of travel ceased Oct. 24, 1885, in accordance with instructions from Governor Alger as explained in the following letter:

OFFICE OF THE SECRETARY OF THE STATE BOARD OF HEALTH,
Lansing, Michigan, October 21, 1885.

To the Michigan State Health Inspectors of Travel:

GENTLEMEN:—The State Health Inspection Service, established by this Board under Act No. 230, Laws of Michigan, 1885, *will cease immediately* in accordance with a letter this day received from Governor Alger, in which he says: "Of course, however, the State Board will not discharge these officials until the [United States] Government takes the matter up."

By request of the Governor, I have informed Dr. H. W. Sawtelle, U. S. Marine Hospital Service, Detroit, Mich., that "this State will take no further action in the matter."

I understand that the reason for this is that the Governor considers that the "Regulations for the Maintenance of Quarantine Inspections on the Northern Frontier of the United States," issued by the Treasury Department of the United States (Department No. 153), and approved by the President of the United States, is applicable in Michigan as well as in other States, and that the United States Government should maintain the inspection in Michigan as well as in other States.

In closing, permit me to thank you for your efficiency. During your service, no small-pox has entered Michigan, so far as known; but it has been reported to have been conveyed from Montreal, by person or otherwise, to Maine, New Hampshire, Vermont, Massachusetts, Rhode Island, New York, Pennsylvania, Illinois, and Wisconsin. The most exposed of any State, Michigan, has so far escaped.

Very respectfully,
HENRY B. BAKER, *Secretary.*

The Marine Hospital Service immediately took charge of the work of inspection at Port Huron and Detroit, but no reports of the work were sent to this office.

Inspection at St. Clair City.

In accordance with a recommendation made by the Secretary of the State

Board of Health that an inspector be appointed at St. Clair City, the Marine Hospital Service appointed Dr. E. H. Deyoe inspector at that place, and issued instructions for his guidance. Letters from the health officer, mayor of the city, and others had urged the necessity of an inspection at St. Clair. The following letter sets forth the reasons for having an inspector at St. Clair:

OFFICE OF THE STATE BOARD OF HEALTH,
Lansing, Mich., Nov. 5, 1885.

J. B. Hamilton, M. D., Surgeon General U. S. Marine Hospital Service, Treasury Department, Washington, D. C.

DEAR SIR:—A letter from Linus Jones Peck, of Port Huron, a prominent lawyer of that section, argues very forcibly in favor of an inspection service at Saint Clair City, twelve miles below Port Huron. He says: "Opposite St. Clair, at Courtright, in Ontario, is one terminus of the Canada Southern Railway, which branches off from the main line at Saint Thomas. A steamer ferry boat is constantly running between Courtright and Saint Clair, and is constantly bringing passengers from all parts of the Dominion into Michigan at this port. The same reasons which have induced the Board of Health to appoint competent physicians at Detroit and Port Huron to look after immigrants and others, with a view to preventing the introduction of small-pox on this side the line apply with the same force, in proportion to the number coming in as at the other places named, and they urge us to apply to you for the appointment of one there."

In addition to the above letter, I have also received letters from the mayor and the health officer of Saint Clair City, urging this Board to provide for an inspection service there. From the information I have in regard to the danger of the introduction of small-pox at Saint Clair, I am led to believe that an inspector is needed at that place. Will you have the kindness to inform me, at your earliest convenience, whether you will provide for one there? and oblige,

Very respectfully,

HENRY B. BAKER, *Secretary.*

CLOSE OF THE INSPECTION SERVICE.

The United States Marine Hospital Service continued the inspection to Dec. 31, 1885, inclusive, when it was discontinued. The epidemic at Montreal had so far abated by the middle of December as to cease to give uneasiness except to a few who were especially watchful. Under date of Dec. 23, 1885, the Secretary of the State Board of Health of Maine wrote as follows: "Although there has, in Montreal, been a very great diminution in the death-rate from small-pox, we ask you to bear in mind that, as far as the lumbering interests are concerned, there is still as much danger as ever in remitting precautionary measures against the introduction of the disease into the camps. In many of the parishes in the lower part of the province below Quebec, small-pox prevails to an alarming extent." He also reported that small-pox was known to be, or lately to have been, in 18 places in Canada. The public alarm, however, had disappeared. A very general vaccination had taken place throughout this State, and the health authorities were generally instructed as to the best methods of preventing the spread of small-pox should a case enter Michigan. Notwithstanding the occurrence of small-pox in very many places in Canada and in several of the United States, and in at least seventeen foreign cities, no small-pox is known to have been brought into this State during the continuance of the inspection service in 1885*, and the inspection of travelers and the disinfection of baggage, household goods, etc., by the Health Inspectors of Travel should probably be credited with this fact. The information so freely disseminated by the State Board of Health, the general activities of local boards of health throughout this State, and the intelligent coöperation of the people generally, will greatly diminish the danger of any serious spread of small-pox should it be introduced in the immediate future.

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*Except the family named Picher mentioned on page 199, which passed through during the period of incubation.

NEED OF A CONSTANT INSPECTION.

During the recent conference in Washington of representatives of State Boards of Health, Dr. Wm. M. Smith, the health officer of the port of New York, said that there should be an inspection of travelers at Port Huron constantly, because of the large number of immigrants passing through that place from foreign ports where small-pox and other diseases prevail. The Secretary of the State Board of Health of Michigan has for a long time considered the point of this suggestion a very important one to the whole Northwest. Within two years Michigan alone has had two serious outbreaks of small-pox directly due to immigrants from the old world. A system of inspection of travel at Port Huron and Detroit that would secure the isolation of all persons sick with *any* dangerous communicable disease, and the disinfection of all infected baggage, clothing, etc., is well worthy adoption. If the National government will not maintain such an inspection, it might pay Michigan to do it alone. The relative importance of the several communicable diseases as causes of death to the people of Michigan may be inferred from the fact that for a long series of years scarlet fever has caused eight times as many deaths, and diphtheria has caused sixteen times as many deaths, as small-pox. The probable numbers of deaths per year in Michigan from several communicable diseases, named in inverse order of importance, have been as follows: small-pox, 106; measles, 266; whooping-cough, 312; scarlet fever, 888; diphtheria, 1,784.

ACTION TO PREVENT SMALL-POX, BY VACCINATION, ETC., IN LUMBERING CAMPS.

The danger of the introduction of small-pox into Michigan by the thousands of French-Canadians that were sure to flock early in the fall to the lumbering camps of the State, has already been mentioned, and was the subject of anxious thought by those who had public-health interests in charge. Dr. O. W. Wight, health officer of Detroit, who had actively assisted in establishing the inspection service, addressed a letter to the Board suggesting that it would be well to send a physician into the woods for the purpose of inducing a general vaccination of the employés. The following reply to Dr. Wight's letter explains the action of the State Board of Health:

MICHIGAN STATE BOARD OF HEALTH, OFFICE OF THE SECRETARY,
Lansing, Michigan, October 17, 1885.

O. W. Wight, M.D., Health Officer of the City, Detroit, Mich.:

DEAR DOCTOR:—In further reply to your letter of October 12, recommending that this Board send a man into the lumber woods of Michigan for the purpose of inducing a general vaccination of the employés, I would say that this Board, at its meeting on Tuesday last, thoroughly discussed the subject, and acted upon your recommendation so far as possible. While acknowledging the desirability of sending a man as you suggest, the Board could not see its way clear to providing for sending a physician to every lumber camp in Michigan, because of lack of funds,—the epidemic contingent fund of $10,000 being small for its present use even if any portion of it could lawfully be appropriated to the work of preventing the prospective spread of disease *within* the State before an actual outbreak shall occur.

The Board, however, directed me to get into communication with as many lumbering camps in Michigan as possible; to send them pamphlets giving the best methods for the restriction and prevention of small-pox by vaccination, isolation, and disinfection; to urge the importance of the vaccination of the employés, and to assist them in procuring the virus. To this end I have addressed a letter to the health officers of all the townships of northern Michigan in which there are probably lumber camps, requesting them to send to this office the names and postoffice addresses of the owners, contractors, or foremen of lumbering camps in their jurisdictions, and to use their influence in urging the importance of the vaccination of employés in such camps. I enclose a copy of the letter, and an abstract of the proceedings of this Board at its meeting October 13, 1885.

There is one advantage in the system adopted by the Board over the one of sending a man to visit the lumbering camps. It is this: We will exert a more *immediate* influence upon nearly all the lumbering camps. One man could not hope to get around very soon. I notice that in a recent communication to The Evening News you speak rather slightingly of the local health officers. As a matter of fact, in dealing with such a disease as small-pox, especially when spurred up and assisted by this office, local boards of health, as a rule, are reasonably active and thorough. They have full power to offer free vaccination and otherwise to deal with outbreaks of any communicable disease in lumbering camps. It will be the aim of this office to see that they have all necessary information and prodding, and also that the lumbering camps be urged and instructed in regard to vaccination.

I have written a communication for the Lumberman's Gazette of Bay City, and shall communicate very soon with as many of the leading lumberingmen of the State as possible. I would be glad to receive from you all the information you may possess that would be of assistance in disseminating information among the lumbering camps,—such, for instance, as the exact address of any camp.

Please accept cordial thanks for your letter of October 15.

Very respectfully, HENRY B. BAKER, *Secretary*.

At the October meeting of this Board, as stated in this letter to Dr. Wight, the secretary was directed to get into communication with the lumbering districts of the State as speedily as possible, for the purpose of urging measures for preventing the introduction and spread of small-pox among men employed in lumber camps, principally by securing a general vaccination of all lumbermen in camps. October 16 a letter was prepared and a copy sent to each health officer in the following 33 counties: Alcona, Alpena, Arenac, Bay, Benzie, Charlevoix, Cheboygan, Clare, Crawford, Gladwin, Huron, Iosco, Kalkaska, Mackinac, Manistee, Mecosta, Menominee, Midland, Missaukee, Montcalm, Montmorency, Muskegon, Newaygo, Oceana, Ogemaw, Osceola, Oscoda, Otsego, Presque Isle, Roscommon, Saginaw, Sanilac, and Wexford. Copies of the letter were sent to 499 health officers (and presidents of cities and villages and supervisors of townships in which no health officer was appointed) in the above counties. To each of these health officers (or to presidents of villages, cities, or supervisors of townships where no health officer had been returned) there were sent, in addition to the letter, five copies of the printed document [No. 54] relative to the restriction and prevention of small-pox, two blanks [L] for reporting outbreak of contagious disease, and one return stamped envelope.

The letter is as follows:

MICHIGAN STATE BOARD OF HEALTH, OFFICE OF THE SECRETARY,
Lansing, Mich., Oct. 16, 1885.

Health Officer of the Township of ——————, *Michigan:*

DEAR SIR:—The danger of the introduction of small-pox from Canada into the lumbering camps of this State is considered very great. This office desires to get into communication, as soon as possible, with the lumbering camps of Michigan, for the purpose of inducing a general vaccination of all the employés, of assisting them in procuring good vaccine virus, and of distributing the documents of this Board stating the best methods for the prevention and restriction of small-pox, including vaccination, isolation, and disinfection.

You can assist in this work by personally urging upon the owners, contractors, and foremen of lumbering camps the importance of requiring the vaccination of their men.

Please distribute the copies of the document on the prevention of small-pox, which I send you, where they will do the most good.

It is important that this office have prompt notice of the outbreak of small-pox. Copies of a blank for a notice to this office are sent to you by this mail.

You can also assist the work of this Board by sending to me a statement of whether there is a lumbering camp in your township, and if there is, the name of each, and the names and postoffice addresses of the owners, contractors, or foremen. Will you have the kindness to do this?

I enclose a stamped envelope for your reply. Very respectfully,

HENRY B. BAKER, *Secretary*.

The names of fifty-nine prominent lumbermen in different parts of the State were secured from the State Gazetteer, the Lumberman's Gazette, and by letters from and by personal inquiry among men acquainted in the lumbering districts. A letter was sent to each of them urging vaccination of all employed in lumber camps, stating where good bovine vaccine virus could be obtained, asking names and location of lumbering camps in their knowledge, names and postoffice addresses of owners, contractors, or foremen, and requesting coöperation for the public good. With this letter there were sent, October 19 and 20, three copies of document No. 54 on the restriction and prevention of small-pox, and one return stamped envelope.

In response to the letter to health officers, presidents of villages and cities, supervisors, etc., 169 replies were received. These replies contained information regarding the presence or absence of lumber camps within the jurisdiction of the writer, or gave the address of lumbermen, foremen, or contractors having charge of camps within their personal knowledge.

In response to the letter sent to 59 prominent lumbermen, 13 replies were received containing information in regard to their own camps, the addresses of their foremen, etc.

The number of lumbermen, foremen, and contractors in charge of lumber camps reported from both these sources were, excluding duplicates, 419.

From the information received from the above sources, the following letter was sent to 419 persons. With this letter were sent to each person seven copies of the printed document [No. 54] on the best methods of restriction and prevention of small-pox, one pamphlet [No. 86] on the work of health officers, two return postal cards and one blank [L] for reporting outbreak of contagious diseases. One copy of French leaflet [circular No. 68] instructions how to prevent contagious diseases, was sent to about two hundred persons :—

MICHIGAN STATE BOARD OF HEALTH, OFFICE OF THE SECRETARY,
Lansing, Mich., October 24, 1885.

To the Owner, Contractor, or Foreman of a Lumber Camp:

DEAR SIR:—The danger of the introduction of small-pox into the lumbering camps of this State is considered great. This Board desires to urge upon the owners, contractors, and foremen of lumber camps the extreme importance of vaccinating all their employés, both as a protection to themselves and to the public. Good bovine vaccine virus points can be obtained of E. L. Griffin, M. D., of Fon du Lac, Wisconsin, at $10 per hundred, or ten points by mail for one dollar. Each "point" is coated with virus sufficient to vaccinate one person.

Every township board of health is authorized by law to offer free vaccination, and this is an expense that nearly every township can well afford to bear, especially now. I have urged upon the health officer of each township in your vicinity the necessity of this; and probably your township board of health will see it in that light, especially if you will confer with the members.

By this mail I send you copies of a pamphlet giving best measures for the prevention and restriction of small-pox, which I hope you will distribute where they will do the most good. I can send you more of them if you can distribute them where they will be read.

It is important that this office and the local health officer have prompt notice of any outbreak of small-pox. A postal is enclosed, which I hope you will not have occasion to use, for reporting an outbreak of any contagious disease.

Very respectfully, HENRY B. BAKER, *Secretary.*

Besides the several circular letters and packages of pamphlets thus distributed throughout the lumbering area, many letters were written to persons who asked for information as to best sources of vaccine virus, prices, etc.

As a result of the activities of the State Board of Health in the direction of prevention of small-pox, there is abundant evidence in the letters received that very much has been accomplished in influencing a more general vaccination of the people of Michigan, and especially in the lumbering districts, where they have been vaccinated by the hundreds. One propagator of bovine vaccine virus sent nearly 17,000 points into Michigan in six months of 1885.

POISONOUS CHEESE.*

REPORT BY GEO. M. STERNBERG, M. D., JOHNS HOPKINS UNIVERSITY, BALTIMORE, MD.

Dr. Henry B. Baker, Secretary Michigan State Board of Health:

DEAR SIR:—In compliance with the wishes of your Board, communicated to me in your letter of Dec. 5, 1884, I have made an experimental investigation, with a view to determine, if possible, the nature of the toxic agent in the two samples of cheese sent to me, which are said to be poisonous.

I regret to say that thus far no definite results have been reached. But while the results are negative, so far as the main question is concerned, some facts of interest have been developed, and it may be worth while to record the experiments made for the information of future investigators.

Sample No. 1, received Dec. 10, had the appearance and odor of good cheese. Upon cutting into it some of the cavities were found to contain fluid. This had a slightly acid reaction, but did not have the odor of butyric acid. Several culture-flasks containing sterilized *bouillon* were inoculated, with due precautions, from the fluid in several different cavities. These culture-flasks were placed in a culture-oven, maintained at 38° C., and the following day were found to contain micrococci in pairs and in chains. In every case these micrococci were present in great abundance, and no other organisms were found. Direct examination of the fluid contained in the cavities of the cheese also showed the presence of these micrococci, and no bacilli or other micro-organisms were found. From the pure cultures obtained at the outset other cultures were made, and numerous preparations were mounted for permanent preservation.

December 12.—Two rabbits were inoculated sub-cutaneously with culture No. 1 (about 2 c.c. injected). These rabbits remained in apparent good health, and gave no evidence of having been in any way affected by the injections made.

December 14.—Four rats fed with the cheese escaped during the night.

December 15.—A small white dog was fed with the cheese, and ate a piece about the size of a lemon with apparent relish. No result.

December 16.—The dog which ate the cheese yesterday and another small black dog were fed with the cheese and ate with apparent relish. No result.

The same day (December 16), Dr. Duggan, who is assisting me in my experimental work, ate about 15 grammes of the cheese at 2:30 P. M. At

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* For the history of outbreaks of cheese-poisoning in Michigan, and the beginning of the investigations in regard to their cause, see pages 122–128 of the report of this Board for 1884.

5 P. M., he was attacked with nausea and vomiting and had one loose discharge from the bowels. He is not subject to similar attacks and ascribes the symptoms to the cheese which he had eaten.

December 18 to 20.—Three rats were fed with the cheese. No result.

December 22.—A small dog (weighing five kilograms) was given 3 c. c. of a culture-fluid containing the micrococcus above referred to.

On December 23.—The same dog was given 10 c. c. of an alcoholic extract of the cheese. No result.

Sample No. 2, received January 15, 1885. This sample does not differ materially from the other in appearance and would be taken from its odor and taste for good cheese. Like sample No. 1, it contains an acid fluid in a few of the cavities in the interior, and especially near the rind. No odor of butyric acid. Six culture-flasks were inoculated with fluid from the cavities. In one of these flasks a micrococcus developed identical in appearance with that obtained from sample No. 1. The other flasks remained sterile.

January 19.—Two rabbits were injected sub-cutaneously with cultures containing this micrococcus. No result.

January 22.—An alcoholic extract (30 c. c.) from a pound of the poisonous cheese was given to a small dog. This was administered through a rubber-tube, passed into the æsophagus. The dog vomited almost immediately, but showed no indications of distress or ill-health afterwards.

January 23.—Another small dog was given an aqueous extract from one pound of cheese. This dog also vomited at once, but remained well afterwards. It seems probable that the vomiting was due to the introduction of the rubber tube, and the force used in administering the dose. It may, however, have been due to some substance present in the extract which acted as an emetic, and which being ejected at once did not give rise to any further symptoms. A later experiment in which the alcoholic extract from three-fourths of a pound of cheese, fed upon bread, did not produce vomiting, is opposed to this supposition.

January 28.—I injected into a small rabbit (sub-cutaneously) 5 c. c. of an alcoholic extract of the poisonous cheese. The rabbit seemed dull for an hour or two after the injection, but no decided symptoms were developed.

January 29.—Two c. c. of a more concentrated extract was injected under the skin of another rabbit. No noticeable result.

January 29.—A small black dog was fed with an alcoholic extract made from three-fourths of a pound of the cheese (sample No. 2). This had been prepared by first digesting the cheese in strong alcohol, filtering, evaporating to one-third, then adding water acidulated with hydrochloric acid; again filtering and evaporating to about 20 c.c. The dog ate freely of bread wet with this extract, and was under observation for several hours. No result.

Remarks.—So much of the explanation given by Prof. Vaughan in his paper, read before the American Public Health Association at St. Louis, as attributes the organic poison found by him to the butyric ferment, does not receive support from the observations above recorded. No bacilli were found in the cavities containing fluid and none were developed in culture-solutions. The acid present was not butyric acid, which is readily recognized by its odor—that of rancid butter.

There is no evidence that the micrococci found have anything to do with the poisonous properties of the cheese; but the presence of this micrococcus in both samples gives to it a certain significance, and further experiments with it, if it is found in still other samples, should be made.

It seems not improbable that the poisonous principle is a ptomaine developed in the cheese as a result of the vital activity of the above mentioned micrococcus, or of some other micro-organism which had preceded it, and had perhaps been killed by its own poisonous products.

Extended experiments would be required in order to determine whether this suggestion has any value; and experiments upon man will apparently be necessary in order to test the toxic properties of extracts made in such a way as to insure the presence of any alkaloid or ptomaine present in the cheese.

The material sent having been exhausted by experiments made, I respectfully submit this report. Very respectfully yours,

GEO. M. STERNBERG,
Maj. and Surgeon, U. S. A.

On March 10, 1885, about one month after the receipt of the above report, one-half of a poisonous cheese was sent to Dr. Sternberg, with a request that he continue his investigations. The following is his reply:

JOHNS HOPKINS UNIVERSITY,
Baltimore, March 23, 1885.

Henry B. Baker, M. D., Secretary Michigan Board of Health, Lansing, Mich.:

DEAR DOCTOR:—Your letter of March 10, and the sample of poisonous cheese referred to, have been duly received.

Upon its arrival sections of the cheese were made, and examined with reference to the presence of fluids in the cavities, reaction, etc. No fluid was found, but a slight amount of moisture in places showed an acid reaction,—not very decided. A small black and tan dog has eaten freely of the cheese on several occasions without exhibiting any symptoms of poisoning.

Another dog declined to eat the cheese, but when offered at the same time a piece of good cheese, took it readily. This experiment was tried several times and always with the same result; the good cheese was eaten and the poisonous cheese declined. The same dog drank freely of water in which a quantity of the cheese had been crumbled, and was not made sick by it. Two rats have also been fed upon this cheese, and have been given water in which it had been soaked for 24 hours. The result has been negative. Cultures inoculated from the interior of the cheese have in some cases contained a micrococcus similar to that found in specimens previously sent.

My time is so much occupied with other work that I do not feel able to pursue this investigation any further at present. The failure to obtain any symptoms of poisoning in the lower animals experimented upon makes it difficult to see how a biological study can be successfully carried out, and I have neither the experience nor the time to justify me in attempting a thorough chemical examination of the sample sent.

I hold the balance of the sample subject to your orders.

Very respectfully yours,
GEO. M. STERNBERG,
Major and Surgeon U. S. A.

POISONOUS CHEESE.*

BY PROF. VICTOR C. VAUGHAN, M. D., PH. D., MEMBER OF THE MICHIGAN STATE BOARD OF HEALTH.

It is well known that cases of severe illness follow the eating of some cheese. Indeed, such instances have been observed in various parts of the world for the past three hundred years. They are of frequent occurrence in the north German countries and in the United States. In England, they are less frequently observed, while in France, where much cheese is used, we find no record of any such cases.

The number of instances of cheese-poisoning in this country per year must be several hundred, if it does not extend above one thousand. In many reports of the different State Boards of Health we find notices of the effects of poisonous cheese. During the years 1884 and 1885, there were reports made to the Michigan State Board of Health of nearly three hundred persons who became suddenly and violently ill after eating of cheese.

It will be seen from the above statements that this subject is of sufficient importance to demand the attention of those interested in public health. The writer has, therefore, spent a large part of the past two years in the study of this subject, and the object of this paper is to present the results obtained.

The symptoms produced by "sick" cheese, as reported by German and American physicians, agree quite closely and are as follows: Dryness of the throat, nausea, vomiting, diarrhœa, nervous prostration, headache, and sometimes double vision. In short, the symptoms resemble very closely those of a gastro-intestinal irritant, with marked effects upon the nervous system. In individual cases, some of the above mentioned symptoms may not appear at all, or, on account of the greater prominence of some of the others, may not be observed. Notwithstanding these alarming symptoms, recovery generally follows.

I stated in my preliminary report of this investigation to the American Public Health Association in St. Louis, October, 1884, that I had failed to find any record of a case terminating fatally; although I then inferred from the language of Hiller, whom I quoted, that a fatal termination was not unknown. Since that time I have found that Husemann, in his work on toxicology, refers to some fatal cases. Dr. Henry B. Baker states that a fatal case occurred in Lansing a few years ago. Death results from prostration, and in the observed cases did not appear until from eight to ten days after the eating of the cheese. There were no deaths reported from the cases in this State in 1884 and 1885. From one of the reports made by a physician to the secretary of the Board, I take the following quotation concerning the symptoms: "Every person who ate of the cheese was taken violently sick. They were attacked with vomiting of thin, watery substance at first; later the vomited matter became thicker and reddish. At the same time there was diarrhœa, the evacuations being thin and watery. There was not much pain, except in the stomach. The tongue at first had a white coat, but later became red and dry. The pulse was very weak and irregular, the face pale and cyanotic. One little boy who ate freely of the cheese came very near dying. His body was covered with blue spots."

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* For history of outbreaks of cheese-poisoning in Michigan, and of the beginning of the investigations in regard to the cause, see pages 122–128 of the Annual Report of this Board for 1884.

The symptoms of cheese-poisoning and those of sausage and fish-poisoning are very similar, though death from eating poisonous sausage and fish frequently occurs in Germany and Russia. Böhm reports the mortality from sausage-poisoning in Germany as from 23.2 to 54.2 per cent.; while Müller reports only six deaths in 343 cases occurring in Holland in 1874; a mortality of less than 2 per cent. It is altogether probable that many of the earlier cases reported were in reality produced by trichinæ. The mortality from fish-poisoning among the inhabitants along the Volga is reported as high, although exact figures are wanting.

From the studies of Sengbusch, Owsjannikoff, and Berkowsky, it is evident that the toxic agent in the fish arises from partial decomposition. The fish consist of three species of the genus *Acipenser*, *A. sturio*, *A. huso*, and *A. ruthemes*. For the purpose of preservation, they are cut into pieces, salted and buried in wooden casks in the earth. As needed they are taken up and eaten raw. Likewise, Kerner, Paulus, Schlosser, Niedner, and Müller, from special studies on sausage-poisoning, conclude that the toxic agent is due to partial decomposition. I mention these facts in regard to poisonous sausage and fish for the reason that they may throw some light upon our study of poisonous cheese.

Böhm and several others state that cheese which has proved harmful to man may be eaten by the lower animals with impunity. In order to test this, I kept a cat in confinement for seven days, and furnished it only water and cheese from a cake which had poisoned some 30 or more persons. The cat fed upon the cheese freely, and at the expiration of the time appeared in excellent health. The animal was then killed, and a careful post mortem examination failed to reveal any lesion. There was not even the slightest evidence of irritation of the stomach. However, from what I now know of the toxic substance, I am satisfied that the reason why the lower animals were not affected by the cheese was that they did not get the poison in sufficient quantity.

All the cases occurring in this State in 1884 and 1885 were due to twelve cheeses. Of these, nine were made at one factory, and one each at three other factories. I was furnished with a smaller or larger amount of each cheese. Of ten of them I secured only small amounts. Of each of the other two I received about 38 pounds.

The maker of the greater number of the poisonous cheeses has been engaged in the manufacture of cheese for a great many years, and has quite a reputation, justly earned. He owns three large factories. I visited one of these and was furnished every facility for studying the methods of manufacture, the agents used and the vats. The milk is brought in every morning by the farmers of the neighborhood, is poured into a large tin receiver, and thence is emptied into the vats. The milk brought by different persons is mixed, and then used for filling each of the vats, three in number. Many of the rennets are also prepared by the farmers. This is done by emptying the stomachs, scraping off the fleshy parts, filling with salt and drying. The rennets thus prepared and found on hand at the time of my visit were examined and found to be free from any sign of decomposition. The same rennet was used in each of the three vats. If it be true, as the manufacturer thinks, that all the poisonous cheese came from one vat, the rennet cannot be the carrier of the toxic substance. The cheese is colored with annotto, which was examined and found to be free from harmful adulteration. Moreover, the same stock of this coloring agent was used in making the cheese which had proved poisonous and that which remained good. From these facts it is evident that we cannot charge the deleterious effects of certain cakes of the cheese to this ingredient. Coloring cheese with annotto has been so long practiced, and the public demand for this color in cheese is so well established, that it may be regarded, I suppose, as a justifiable adulteration. The vats were lined with tin and seemed to be kept scrupulously clean. They were heated by steam pipes placed underneath. Each vat furnished curd for seven or eight cheeses. The curd is cut, placed in cheesecloth, and subjected to pressure in iron hoops, the expressed fluid finding free exit beneath. The curing room was found to be large and well ventilated. In this the cheeses are placed on shelves and left for fourteen days or longer, when they are placed on the market. The manufacturer states that all the cakes which proved poisonous were made between April 26 and May 6, 1884.

Nearly every cheese manufacturer has his theory as to the cause of poisonous cheese. The majority of them think that it is due to some poisonous plant which the cow eats. I have received a large number of letters from cheese makers on this subject. While many of them think that it is some plant, no two of those writing to me agree as to the special plant. One says that it must be some plant which appears early in the spring, because all the poisonous cheese made in his factory has been the product of early spring work. For a similar reason, another thinks that the plant must appear in midsummer, while a third is equally certain that the plant is eaten by the cows only late in the fall. One, Mr. C. B. Lambert, argues that the poison arises from the whey, and that poisonous cheese will be made in factories from which the milkmen carry home whey in their cans. But poisonous cheese has been made in factories where this practice is altogether unknown.

All the samples of poisonous cheese examined by me were found to be similar in many respects. From the freshly-cut surface, there exuded drops of a watery, slightly opalescent fluid, which was found to redden blue litmus paper instantly and intensely. If a small piece was dried thoroughly by prolonged exposure to the air, and then moistened with distilled water, the water would give the same intense and immediate acid reaction. I have tested with litmus many samples of good cheese, and have found that while all new or green cheeses feebly and slowly redden blue litmus paper, only the poisonous cakes give the intense and instantaneous reaction. I think that it can be stated that any cheese which will instantly and intensely redden blue litmus paper should be regarded with suspicion. Whether or not all poisonous cheeses have this reaction, remains to be determined by the examination of a larger number than it has fallen to my lot to study. However, this test is easy of application, and every grocer should make it on cutting a fresh cheese. If the sample is dry, a bit of it should be moistened with water, and the paper then applied. The old, foul-smelling cheeses, such as Limburger and Schweitzer, are alkaline in reaction, and poisoning does not result from their use.

Microscopical examination of the opalescent drops appearing on the freshly-cut surface of the cheese revealed constantly small spherical bodies, which have been determined by Dr. Sternberg to be micrococci.

My first step in searching for the poisonous principle of the cheese consisted in treating some of it cut into fine bits, with 90 per cent alcohol, filtering and evaporating the alcoholic extract to dryness at a low temperature. This residue consisted of a fatty mass. Of this I ate a small bit. It had a bitter, acrid taste, and produced within a few minutes marked dryness of the mouth and fauces and constriction of the throat, much the same as that produced by a large dose of belladonna, or its active principle, atropia. Later, there was considerable nausea, and I could readily imagine that a larger amount would have produced vomiting. This experiment was repeated a number of times with the same result, and from it I concluded that the poison, whatever it might be, was contained in the alcoholic extract. This would indicate a chemical poison and not a bacteric one. However, this chemical poison might be generated by the growth of bacteria. For some months I tried to isolate the poison from this alcoholic extract, but was unable to do so; for whatever I tried to dissolve the poison in would either dissolve the fat as well, or would fail to take out the poisonous principle. Besides, the compact, fatty mass extracted with the alcohol was not suitable for further extractions. After many attempts in this direction, I gave it up and made a water extract of the cheese. This I also found, by an experiment upon myself, contained the poison. The watery extract containing only traces of fat was much more suitable for study than the alcoholic one. I then evaporated the watery solution to dryness, at a temperature not exceeding 110°C., but was disappointed to find that the residue was not poisonous. The active principle had been volatilized or decomposed by the heat employed. Next, I tried distilling the aqueous solution. By doing this, I found that the first few drops collected in the receiver had the odor of old cheese, and when taken into the mouth produced the characteristic dryness and constriction. But the amount of the poison obtained in this way was small; and, besides, I thought it altogether probable that partial decomposition of the substance might be produced in making the distillation. Then, I took the aqueous extract of the cheese, shook it with ether, removed the ether with a pipette, placed it in a porcelain dish and allowed it to evaporate spontaneously. The residue contained traces of the poison. Another attempt was made by rendering the aqueous extract of the cheese alkaline with potassium hydrate, then extracting with ether. This process gave the poison in greatest amount, and was followed in all the subsequent work. By re-dissolving the etherial residue in water and again extracting the residue, the poison was obtained in a state of sufficient purity, so that after allowing a concentrated, aqueous solution to stand in vacuo over sulphuric acid, the poison formed in needle-shaped crystals. A small bit of one of these crystals, which, as obtained from one cheese, were large enough to be plainly seen with the unaided eye, placed on the end of the tongue, caused a very sharp, burning sensation, which was soon followed by dryness and constriction of the throat, and nausea. The taste was especially sickening. A drop of the fluid in which the crystals formed, placed on the tongue, produced, in addition to the symptoms mentioned above, griping pains in the bowels, followed by one or more diarrhœal discharges. This was tried several times, not only upon myself, but upon some of my students, who kindly offered themselves for experimentation.

For this substance, I have proposed the name tyrotoxicon,—cheese poison. With potassium ferricyanide and ferric chloride, tyrotoxicon produces Prussian blue. It also reduces iodic acid readily. With the general alkaloidal precipitants, it fails to react. It is freely soluble in water, alcohol, ether, and chloroform. Chloroform was also used in a few trial experiments to separate the poison from the aqueous extract of the cheese, but the amount obtained with this agent was not so great as that secured with ether. Besides the more rapid spontaneous evaporation of the ether rendered it the more suitable. The amount obtained from the cheese was exceedingly small. From one cake, which was nearly entire, not more than two pounds having been removed by the grocer, I secured an amount which I estimated at not more than eight grains; but, from the same quantity of another cheese, I did not obtain more than two grains. I do not suppose, however, that all of the poison was extracted from the cheese. In future experiments I shall endeavor to discover some better method of separation.

The crystals have a pungent odor resembling that of old cheese, and it may be stated here that this odor has been observed in poisonous sausage, according to Husemann and Böhm. It is probable that tyrotoxicon or a similar substance will be found in poisonous sausage. If the crystals be left exposed to the air at the ordinary temperature of a room they decompose, some organic acid, whose composition was not determined, being formed.

I regret very much that I did not obtain the poison in quantity sufficient to enable me to make an ultimate analysis. The question as to the origin of this poison is one of great practical interest, and one which I am not yet able to solve with satisfaction. Tyrotoxicon belongs to a class of poisons known to the chemist under the name of ptomaines. They originate in organic substances which are undergoing putrefactive changes. Only a very small number of ptomaines have been separated. The majority of them have been recognized simply by their poisonous effects. They are, undoubtedly, quite widely distributed, and vary much among themselves in their toxic and other properties. In one sample of ether I found a ptomaine, a small bit of which, injected under the skin of a frog, caused death in a few minutes. Therefore, in using ether to extract tyrotoxicon from cheese, it became necessary to test the ether first. This was done by allowing one pound of ether to evaporate spontaneously in a porcelain dish, and examining the residue, if there was any. At first I was inclined to the theory that the tyrotoxicon originated in imperfectly cured rennets, but I have found it in milk to which no rennet had been added. A student brought me a four ounce bottle which was about half full of milk. The bottle and its contents had stood in the laboratory for more than six months. I removed the glass stopper with which the bottle had been closed, and observed the same odor as that given off from the crystals of tyrotoxicon. The decomposed milk was strongly acid in reaction. It was filtered, the filtrate rendered alkaline, and then extracted with ether; the etheral solution, on evaporation, deposited a small but distinct amount of tyrotoxicon. I then placed one gallon of good milk in a bottle, stopping it tightly, and another gallon in a jar which was covered only with a thin cloth to keep out the dust. After two months these were examined and tyrotoxicon found in the milk from the stoppered bottle, but none in that from the jar. However, the milk in the jar contained other ptomaines, only one of which, trimethylamine, have I succeeded in separating up to this writing.

Evidently, then, tyrotoxicon may originate in milk on long standing in closed vessels. As the putrefactive changes in the milk are due to the growth of minute organisms, the introduction of these organisms into the milk may hasten its putrefaction, and, consequently, the formation of the ptomaine. The germs may be present in portions of milk which adhere to the sides of vessels which are not cleansed as often or as thoroughly as they should be. I would suggest that cheese manufacturers frequently inspect the cans in which milk is brought to them. When cows are kept in filthy stalls, the milk is likely to undergo speedy putrefaction.

I shall continue these investigations, and hope to ascertain with more exactness the conditions under which this poison is formed.

COMMUNICABLE DISEASES IN MICHIGAN DURING THE YEAR ENDING DECEMBER 31, 1885.

COMPILED UNDER THE DIRECTION OF THE SECRETARY OF THE STATE BOARD OF HEALTH.

This paper continues a subject treated for the preceding year on pages 251-291 of the Report of the State Board of Health for the year 1884, and for other years in preceding Reports. Whenever information is received at this office of the outbreak in any locality in Michigan of diphtheria, scarlet fever, typhoid fever, small-pox, or glanders, a letter is sent to the health officer of the township, city, or village in which the disease is present (if the name of the health officer has been reported to this office, if not, to the President of the Board of Health), calling his attention (if the report was not received from him) to the existence of the disease within his territory, indicating his duties and powers and proper measures to be taken in restricting the disease, transmitting documents of instruction with regard to prevention and restriction of the disease, for distribution among families especially exposed to it, and asking for a report relative to the prevalence of the disease and the methods employed for and the success in suppressing it. Except in the case of glanders, for which a special form of letter was employed, the form of the letter generally sent during the year 1885 was substantially the same as that printed on pages 251-252 of the Report of the State Board of Health for the year 1884. With this letter was sent a blank form (L) for notice of the first case of a dangerous communicable disease, a blank form (M) for weekly reports during the continuance of the disease, and the blank form (K) for a special final report. These blanks are printed on pages 253-254 of the Report for 1884.

A large number of replies received in answer to communications in regard to contagious diseases, show a widespread interest among the people and a commendable effort on the part of local health authorities to have every means employed to prevent the spread of contagious diseases. The information contained in these replies has been compiled and abstracted for this article.

DIPHTHERIA.

Diphtheria in epidemic form is not an old disease in this country, though it is supposed to have existed for some time in the old world. An old Sanskrit work describes a disease much similar to diphtheria, and it is thought to be the same disease as the "Syriac ulcer" described by Aretæus. In the seventeenth century diphtheria was epidemic in Italy. It is believed to have occurred in isolated cases both in this country and in Europe. From it George Washington and the Empress Josephine are said to have died. The disease did not receive its present name, however, until 60 years ago, when Bretonneau called it "diphtherite" (from the Greek words for false skin or membrane). Diphtheria did not excite any considerable attention in Europe until the violent epidemic of 1853 in Paris. In 1856 the disease was transplanted from France to England. In 1859 it became thoroughly colonized in England as a widespread epidemic*. The first death from diphtheria in this century in New York City, certified to by a physician, is said to have been that of a German woman, at 638 Hudson street, on February 15, 1852. Two other fatal cases were reported in 1857; in 1865 the number of fatal cases in New York City amounted to 534; in 1875 to 2,329†, and in 1876 to 3,510.‡

Diphtheria has occurred in Michigan during the past 25 years. In the year ending April 5, 1868 (the first year in which the vital statistics of Michigan were collected), there were reported to the office of the Secretary of State only 110 deaths from diphtheria. During the year 1869 only 89 deaths were so reported. In 1877 the number of reported deaths from diphtheria had risen to 593, while in 1881 there were reported in the same manner 2,063 deaths. In 1884 (the last reports received at the office of the Secretary of State), there was a falling off, only 1,065 deaths being reported. The average per year for the 12 years 1873-1884 of deaths reported to the Secretary of State is 916.§

DIPHTHERIA IN MICHIGAN.—YEAR ENDING DECEMBER 31, 1885.

During the year 1885 there were reported to the office of the State Board of Health (not counting in this connection the reports on the weekly-report cards, which are for another purpose and do not usually state the number of cases and deaths) 467 outbreaks of diphtheria in 396 localities. In these outbreaks there were reported 4,018 cases and 964 deaths. There were thus reported 103 more cases and 59 more deaths than were reported in the same manner during the year ending December 31, 1884. In 1885, 105 more outbreaks in 94 more localities were reported than in the previous year. (In addition to these outbreaks thus reported, diphtheria was reported, in 1885, on the weekly-report cards of observers for the State Board of Health in about 26 other localities. In such instances as these the local health authorities failed to communicate further with this office as they were requested to do. These cards do not state the number of cases and deaths, but the relative order of prevalence as compared with other diseases then prevalent. They should not therefore be considered in reckoning the per cent. of cases to outbreaks, etc. These cards have not, previous to the year 1885, been employed in compiling the article concerning the contagious diseases.)

According to the reports for the year 1885, the average number of cases to each outbreak was 8.6, or 2.2 less than that reported during the year 1884;

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* Diphtheria. Its Nature and Treatment. Mackenzie, pp. 14-21.
† American Journal of Medical Sciences, April, 1885, p. 318.
‡ Diphtheria and Its Treatment. Chas. H. S. Davis, M. D., p. 3.
§ Registration Reports, Michigan, for the years 1868, 1869, 1877, 1884.

and the average number of deaths to each outbreak was 2, or .5 less than in the previous year. The per cent. of deaths to cases reported during the year 1885 was 24, one more than shown by the reports for the year 1884. The reported mortality from diphtheria is very high. "Oertel puts it, in severe epidemics, at 30 and 40 per cent. In Massachusetts the death-rate from it ranged from 6 to 80 per cent. of the cases attacked, and in some localized epidemics every person attacked has died. Trousseau reports an epidemic where, of sixty persons attacked, nearly every one died."* As elsewhere shown, the mortality is mostly among persons under ten years of age, therefore the age of those among whom the disease occurs has much to do with the death-rate. The high mortality from diphtheria, coupled with the inability to prevent its general spread by such protective measures as vaccination, entitle this disease more than small-pox or even scarlet fever to a place among the great plagues, though, while there may be still in some localities neglect of duty, the time has passed by in the United States, owing to a dissemination of sanitary knowledge among the people, when any disease can assume such wide proportions as the Black death and other plagues which almost depopulated cities of the past.

Considering the reports similar to those received during the year 1884, there might seem to have been more cases and deaths from diphtheria during the year 1885 than in the year 1884, but this apparent increase in the number of cases and deaths is probably due to better and more reports having been received in the year 1885. For example, 211 more health officers and 141 more clerks made annual reports, from which reports part of this information is gathered, at the close of the year 1885, than at the close of the year 1884. The methods employed in the office of the Board in gathering and compiling information are every year being improved. Thus, there were received, during the year 1885, 82 special final reports at the close of outbreaks of diphtheria, giving information used in the compilation of this article; during the previous year only 68 such reports were received. At the beginning of the year 1886, a new system was inaugurated for the purpose of bringing in still more of these reports.

On page 230 will be found a map of the State of Michigan exhibiting by counties the number of localities where diphtheria occurred; also the number of outbreaks, cases and deaths in each county. As will be seen from this map diphtheria was reported from only 21 localities in the Upper Peninsula; the greatest number of localities in any one county from which diphtheria was reported was in Van Buren county, where reports were received from 17 localities. The greatest number of outbreaks (22) was reported from Montcalm county. In Wayne county the greatest numbers of cases (1,230) and deaths (318) were reported. Of the cases and deaths in Wayne county, 1,027 cases and 270 deaths occurred in the city of Detroit, where diphtheria prevailed during the entire year. Not counting the outbreak in Detroit and a few outbreaks reported on the annual reports of clerks and health officers where the time of year was not mentioned, of the 431 outbreaks where the time of year was stated, 63 (the largest number in any one month) began during the month of January, while during the five months, September–January inclusive, over one-half of all the outbreaks began. These figures exemplify and add new weight to the conclusions, deduced from observations through a series of years, that diphtheria is a cold-weather disease,

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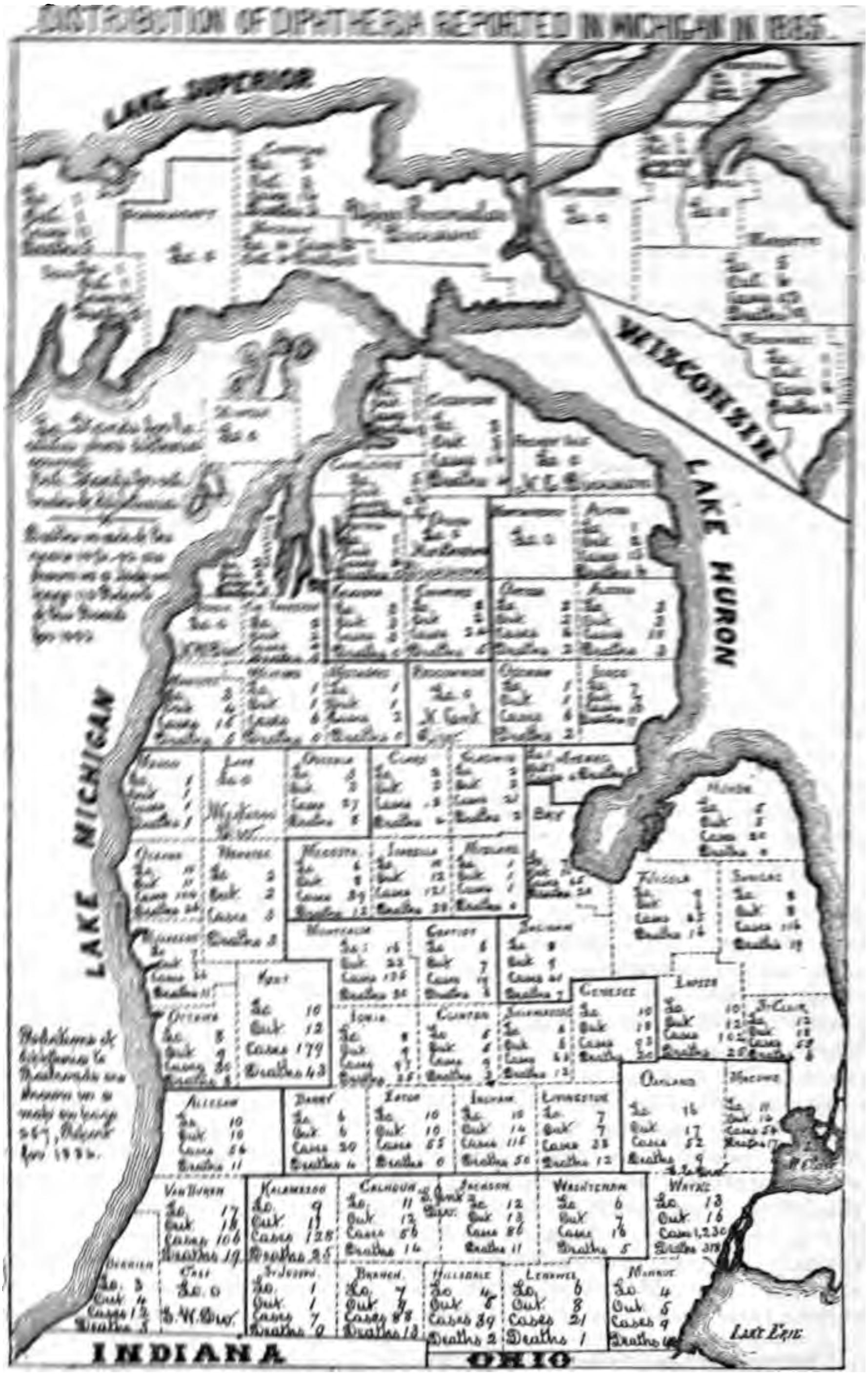
* "Diphtheria and Its Treatment," by Chas. H. S. Davis, M.D., p. 4.

DISTRIBUTION OF DIPHTHERIA REPORTED IN MICHIGAN IN 1885.



most prevalent when catarrhal difficulties most predominate, the throat being then more susceptible to the diphtheritic cause or poison.

AGE OF DIPHTHERITIC SICK AND DECEDENTS.

Ages were reported to this office of 1,037 cases which recovered from attacks of diphtheria, and of 357 who died of that disease during the year 1885. These reports gave in each case the "age in years, last birthday," hence it has been assumed that on the average .5 should be added to the given age to express the actual age. According to this method of reckoning, the average age of those who recovered was about 13.5 years, and the average age of those who died was 8.4 years. Of those who died 7 per cent were under 10 years of age. Only 12 deaths were reported of persons over 20 years of age, and only 2 deaths of persons over 35 years of age. One of these was a patient 47 years old. Two cases recovered at 60 years of age. Thirty-five (the greatest number reported at any one age) died at 8 years of age, and 34 died at 3 years of age. Seventy-five (the greatest number at any one age) recovered at 7 years of age, and the same number recovered at 6 years of age. The age of all those reported is by periods as follows:

Age.	Recovered.	Died.	Total.	Per cent of deaths to cases.
Under 1 year	4	3	7	43
From 1 to 5 years	170	115	285	40
From 5 to 10 years	324	135	459	29
From 10 to 15 years	254	67	321	21
From 15 to 25 years	167	26	193	14
From 25 to 45 years	119	9	128	7
Forty-five years and upward	19	1	20	5
" One adult "	....	1	1	100
Total	1,057	357	1,414	25

These results are similar to those obtained by Thursfield from an examination of nearly 70,000 fatal cases contained in the returns of the Registrar-General,* though according to his figures 80 per cent of all fatal cases were under 10 years of age. In Massachusetts, during the twenty years 1863–82, the per cent of deaths from diphtheria under 10 years of age was 84.† The per cent obtained from these reports (71) is uncommonly low. It will be seen from these data that diphtheria, as a cause of death, is especially a disease of children, and that, if by prompt and thorough preventive measures being taken children may be tided over the first ten or twenty years of life, the mortality from diphtheria might be reduced to a minimum.

SOURCE OF CONTAGIUM.

Seventy reporters (health officers and clerks) stated that they could not find the source of contagium, that the mode of introduction of the disease was unknown. Twenty-four reporters answered the question as to the source of contagium by saying that it was sporadic. One health officer reports an outbreak where "the family had not been away from home nor had any one visited them. They had just had chicken-pox. The family lived in a log shanty with leaky roof, and water in the cellar. It seems a case of spontaneous development." There seems to be a general consensus of opinion, however, that (whether or not the disease can arise without a specific cause) diphtheria is contagious.

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* Diphtheria, Its Nature and Treatment. Mackenzie, p. 29.
† Mass. Registration Report, 1882, p. 85.

All evidence as to the origin of the disease without a specific cause must necessarily be only negative so far as relates to a supposed specific cause. A failure to find the source of contagium does not prove that there was no such source. One hundred and forty-nine reporters attempted either to trace the outbreak to its source in a previous case or to assign for it a local cause. Some of the opinions expressed were only conjectural. For example, some gave such answers as the following:

"Dampness in house," "unhealthy surroundings," "exposure," "sudden change of temperature," "local causes" (two so reported), "bad sanitary condition" (two so reported), "impure water" (ten so reported), "impure water and damp cellars," "impure water from pond where logs were floated and straw from stables put in," "stagnant water" (five so reported), "stagnant water and decaying vegetables" (two so reported), "impure water and bad diet," "filth and impure water," "water and filth under house" (two so reported), "local filth" (three so reported), "decaying vegetables," "household filth," "decaying log house," "living on swampy ground," "the family where it originated was the filthiest of the filthy," "open well of long standing," "washing sheep and bathing in a stream," "some others in the neighborhood had similar but lighter attacks before I was called," "no special cause except bad drainage," "infected well-water, probably by drainage from barn-yard," "overflowed land," "slops thrown out from saloon where there was poor drainage," etc. One health officer writes: "Upon investigation I found the cellar under the house where the case was found nearly full of water, with decayed vegetables in the same, the well being but a few feet away. I can trace the disease to no other cause." One health officer writes that the source of contagium was "not positively ascertainable, as no member of the family had been away for a long time, no one had been near the patient who could carry the contagium, there had been no case near here for a year or more. The family lives in a house situated in a low, filthy place. The water stands under the house a good share of the time." Henry G. Cooley, health officer of the township of Belvidere, reported concerning an outbreak of diphtheria in his jurisdiction of 29 cases and five deaths, during the months of August to October, as follows: "As near as I can trace the cause, it is to the use of water from a hole dug in the ground near a swamp, and near which the body of a horse had been buried." One health officer writes concerning the question relative to the source of contagium: "A boy six years old while very warm and sweating freely, took off his clothes and bathed in a ditch or pool of stagnant water. That night he complained of headache, and the next day of sore throat, from which he died." Nothing is said of any other possible source of contagium for this first case previous to his sickness. Shortly before his death two children went into the house where he was sick, took the disease, carried it to school, and "from that source the whole school was infected." There were in this outbreak 38 cases and four deaths. Henry O. Whelan, health officer of Deerfield township, writes: "Two have already died and I think two more at least will die. The primary cause of the disease I attribute to bad water and malaria arising from cedar swamps near by, and to decaying vegetable matter therein. * * * The well from which two of the families were using the water was seventy feet deep, and the water was obtained by a force pump through an iron pipe. The water had a very peculiar taste outside of the iron pipe."

Conrad George, M. D., health officer of the city of Ann Arbor, reports an outbreak or diphtheria during the month of February in the same house where diphtheria occurred during the fall and winter of the previous year (Report Michigan State Board of Health 1884, p. 259). Concerning this outbreak Dr. George writes:

> "I had the entire house fumigated with sulphur after the last patient had recovered. Last Saturday, February 21, a relative from Dexter township came on a visit with her two children, a boy aged 18 months and a girl aged 4 years. On Wednesday the boy was taken down with diphtheria and yesterday (Friday) the girl was similarly attacked. There can not be a mistake as to the nature of the disease. * * * * The woman claims that there was no diphtheria in her place and that she stopped nowhere until she arrived in this house. No one has visited the place and the disease does not elsewhere exist in the city at present. Now I am forced to the opinion that the disease must start *de novo* in this house. I can not see any other source for these five cases."

In reply to a question asked by this office as to whether the privy had been disinfected, Dr. George stated that "there has been no overflow from this source," probably misunderstanding the nature of the question or the purpose of the question, which was to point out a probably infected place not disinfected. He also stated that the drinking water was taken from a well across the road which was used by several families.

Of those outbreaks where filth, defective sewers, etc., are reported as the source of the contagium or the cause of the disease, it is not judicious to affirm that the sewer, etc., causes the disease. It may have carried the cause; but there are undoubtedly many other houses with defective drainage and filthy sewers where diphtheria has never occurred.

Morell Mackenzie, M. D., lecturer on diseases of the throat at the London Hospital Medical College, etc., writing of the possibility of diphtheria arising *de novo*, says:—

> "Although the disease so often arises in connection with bad drainage, foul habits and impure water supply; and although it is so often impossible to trace the remotest channel or contagion, yet the whole tendency of sanitary science is opposed to the doctrine of the spontaneous origin of specific diseases. It must not be forgotten that in those cases where the disease appears to enter the system through the use of drinking water contaminated with excrementitious matter, the specific germs of the disease derived from persons previously suffering from it, may have found their way into the water. I have frequently known the disease occur suddenly in remote country districts, where careful inquiries have failed to discover the smallest evidence of infection, but similar phenomena are often observed in connection with scarlatina and small-pox—diseases which no one would now attribute to a spontaneous origin."*

Dr. Mackenzie also says that "the disease is much more common in rural than in urban districts." Dr. Wm. Farr called attention to the fact that the proportion of deaths from diphtheria to the number of children born is greater in the healthy, rural districts of England and Wales than in Liverpool.†

The mean annual death-rate from diphtheria during the seven years, 1877-1883, was greater in the city of Detroit than in the State of Michigan taken as a whole, but it was not so large as in *some parts* of the State, which were *unsewered, rural, and sparsely settled.*[*]

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* Diphtheria; Its Nature and Treatment, Mackenzie, p. 23.

† Diphtheria and Its Treatment. By Chas. H. S. Davis, M.D., p. 3.

James T. Whittaker, M. D., professor of theory and practice of medicine, Medical College of Ohio, speaking of bad ventilation, sewer gas, etc., says: "These are factors which do undoubtedly favor the spread of infectious maladies, but never originate the birth of one. A fright may cause a premature birth, Juergensen remarks facetiously, but it would never conceive a fetus."[†]

In many of these outbreaks in which the health officers did not trace the first case to the source of contagium, the second and remaining cases were traced to contagium from the first case. Thus, James Gibbs, health officer of Benona township, Oceana Co., reports concerning an outbreak of 38 cases including 8 deaths in his jurisdiction from June 11 to October 25, 1885: "The source of contagium is not known in the first case, but after that it was allowed to spread because the doctor insisted that it was no contagious disease."

H. McCall, M.D., after speaking of three cases of diphtheria in the township of Lapeer, writes:—

> "The mother had assisted to take care of all the children [sick with diphtheria], and on Saturday, January 30, coming to the city, she called in the house of a married daughter with a family of five children, stayed but a short time, did not remove her wraps in the house. On Tuesday, February 2, I was called to see a girl 11 years old at the second house sick with diphtheria,—one tonsil covered with a dark, heavy, muddy patch, and the other side a dark livid color. A little boy 3 years old was playing on the floor. I looked into his throat and there was a small patch on one tonsil about the size of a split pea. He was feeling quite well and playful. In the evening, however, he was having very high fever, nose became stuffed and cervical glands terribly swollen. On February 3 an older sister complained of her throat, and there we found the characteristic signs of the enemy. They all recovered, however, except the boy, who died on Sunday morning, 8th inst., after expectorating two separate casts of the trachea, one on Thursday and the other on Saturday. In the first family we have no history of contagium; in the second family we have the visit of the mother for a few minutes after driving four miles in the cold."

OUTBREAKS TRACED TO THEIR PROBABLE SOURCE, IN A PREVIOUS CASE.

The large cities seemed to have acted as centers for the spread of diphtheria during the year 1885 as in the previous year (report of the Michigan State Board of Health, 1884, p. 258). For example outbreaks are supposed to have been carried from Detroit to other localities as follows:—Algonac, St. Clair county; Ingham, Ingham county; Dansville, Ingham county; Alpena, Alpena county ("brought by a child from Detroit, or taken coming up on the steam boat from a sick child on board"); Linden, Genesee county; Ypsilanti, Washtenaw county; Greenfield, Wayne county; Taylor, Wayne county, and Plymouth, Wayne county. Three deaths occurred from diphtheria in the village of Dansville, where the source of contagium was stated to be as follows: A physician in Detroit treated a case of diphtheria in that city; the case died, the physician certified it to be "quinsy," and allowed the body to be taken to Grand Rapids. The physician told the room-mate of the patient that it was diphtheria but that he had better keep quiet about it. The room-mate, a young man, returned to his home in Dansville, Mich., already in the first stages of the disease. From him three persons were taken sick with diphtheria and died. Diphtheria was reported in Ypsilanti, where the source of contagium was stated to be as follows: "The bodies of three children who had died of diphtheria in Detroit were carried to Ypsilanti for burial, at three separate times and under a permit from the health officer of Detroit. In all cases they were accompanied by relatives and friends from Detroit, some of them with their throats done up in flannel, just convalescing from the disease." The family mingled with the relatives in Ypsilanti and one of them was taken sick with diphtheria.

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[*] The Influence of Sewerage and Water-supply on The Death-rate in Cities, by Erwin F. Smith, p. 115.

[†] Cincinnati Lancet and Clinic, May 8, 1886, p. 539.

Dr. Wm. K. Moore, health officer of Algonac village, writes of diphtheria in his jurisdiction during the month of December, as follows:

> "This case was brought from Detroit by members of the family who were nursing a relative's child who died of the disease in that city. They claim to have been thoroughly fumigated by the authorities there before leaving the city. The case was of the malignant type."

Diphtheria occurred in the village of Mackinac, concerning which the health officer writes: "The patient left Chicago, Ill., about July 1. The disease was probably contracted in Chicago or en route to Mackinac Island." The disease was also reported to have been brought to Marshall from a "relative in Chicago." A case of diphtheria occurred in Dundee, Mich., which was "taken in Toledo, Ohio, while attending the funeral of a friend supposed to have died from pneumonia." The health officer of the city of Battle Creek writes: "The disease was brought from New York and was epidemic from February to October." Other reports were received as follows: "The first child came down after a visit to Quincy where the disease was." "A young lady attending school at Battle Creek came home with it." "The first case came here from Langston, about 30 miles north of here (Lowell), about nine days before he was taken down—had not been exposed to diphtheria in any way that he knew of." "The family was on a visit to relatives three miles north of the city of Greenville, Montcalm county, Mich. The relatives complained of sore throat." "Five weeks before the patients visited Jackson, Mich." "Taken at school in Coldwater." "Had just come from Muskegon when he was taken down." "Probably contracted on way from Vermont." Outbreaks were reported where the source of contagium was brought from the following cities and villages: Grand Rapids, Monroe, Bay City, "at or near Port Huron," Howell, Mt. Pleasant, Paw Paw, Quincy, Fremont, Armada, Romeo, Grass Lake, Edmore, Milford and Oscoda. It is, of course, but reasonable to expect that large cities, which are centers of communication in other respects should be centers of radiation for communicable diseases. Other outbreaks are reported to have spread from "Berrien county," "St. Clair county," "another county," and neighboring townships, etc. Dr. L. L. Church, health officer, writes concerning an outbreak of diphtheria in Winfield township:

> "It was brought into our township from Mecosta county. They are having it just across the line. A girl who was working at a place in the other county was taken sick with diphtheria. I do not think the physician knew what was the matter; her parents, going there to take care of her, brought it into their family."

Outbreaks are reported to have been conveyed by "direct communication," "direct exposure to contagium," "contact with infected person," "infection at school," "clothing," "taking care of diphtheritic patients in Northville," etc. One health officer reports an outbreak where the source of contagium was stated to be a "visitor who had lately recovered from an attack of diphtheria"; another reports that the "father of the child [first taken sick] had been nursing a family sick with diphtheria, and probably brought some infected article home with him"; another health officer reports that the patient "stayed all night at a house where a child was sick with the disease"; another states that a "person went to work for a man in Mundy, Genesee county, whose family had diphtheria. He came home and was taken sick." O. W. Tock, M. D., health officer of the village of Flushing, reports an outbreak of 8 cases including 4 deaths during the month of November, and states concerning the source of contagium, "a young man with sore throat visited at the house. He came from a family where they had diphtheria." Dr. R. C. Traver, health officer of Somerset township, Hillsdale county, writes: "The source of contagium was from a visit of the family to a brother's in Lenawee county, which had previous to this lost some children with the same malady." Dr. John W. Hopkins, health officer of Tallmage township, Ottawa county, writes of an-outbreak in his jurisdiction: "So far as I am able to find out, it was introduced at church during revival meetings. Many strangers were present at large evening meetings, very close house, badly ventilated." L. L. Church, health officer of Winfield township, Montcalm county, reports: "The first case was brought into the township by a boy coming to visit his grandmother who was taken sick after nursing the child." One health officer writes concerning the introduction of diphtheria into his jurisdiction as follows: "A doctor moved into the neighborhood with a child sick with what he called quinsy, but he afterwards told people in confidence that it was diphtheria. The doctor's child died September 12."

Dr. H. F. Peckham, health officer of Hope township, Barry county, reported an outbreak in his jurisdiction during the month of February, in which the source of contagium was stated to be as follows:—

> "Two young ladies by the name of Hammond went to Kalamazoo on a visit. While there both were stricken with diphtheria, and one of them lived nine days, the other 18 days. The mother of the above cases took care of them. After their death she returned to her home in Hope township. The next day after her return I called upon her. She stated to me that the health officer had caused a thorough disinfection of all the rooms and her clothing. I thought best to order her to remain in doors. Within 10 days her youngest child, 3 years old, came down with the disease and died. Another one 12 years old recovered. While the father of the family was taken and died, Mrs. Hammond and her son did not have the disease. The premises were closely guarded, no one allowed to go there or come away. The period of incubation was about 8 days. The restriction was complete. I believe if it had not been so the difficulty would have terminated in a regular epidemic. I think the health officers in Kalamazoo * * * should have retained her longer."

In reply to a letter sent from this office, Dr. H. B. Hemenway, health officer of Kalamazoo, stated that the young lady was not well when she came to Kalamazoo, that within two or three days a physician was called in and that on the second visit he diagnosticated the case as diphtheria, that so far as known the patient had not come in contact with diphtheria in Kalamazoo, and that it was his opinion, as well as the opinion of the attending physician, that she did not contract the disease in Kalamazoo.

A communication was sent to Dr. Peckham, in reply to which a letter was received from him stating as follows:—

> "I have received a letter from Dr. Hemenway substantially the same as the one he wrote to you. I shall answer it to-day. He seemed to be laboring under a misapprehension in relation to the Hammond family. I shall endeavor to set him right. The facts are the two young ladies went to Kalamazoo in perfect health, and both went at the same time. There was no 'sore throat,' neither had there been in the neighborhood. I saw them a few days before leaving for Kalamazoo,—perhaps two days, and both stated that their health was good. Agnes did not die first, it was Helen. She was sick nine days. Her mother and brother stated to me that Dr. H. H. Schaberg diagnosed the

affection as tonsilitis, and treated her accordingly for four days. He then seemed to find out that it was diphtheria and changed his treatment. They also told me there were several cases in the immediate vicinity." Dr. Peckham thinks that Mrs. Hammond was not detained long enough in Kalamazoo, and continues as follows: "I am satisfied that proper sanitary regulations will keep the disease in abeyance. Had they, as I believe, detained her thirty days, and caused a thorough disinfection of her clothing and also her *hair* (*the hair seems to be a sufficient repository for the disease*) the outbreak in this township would not have occurred. Had the disease been contracted at home, as Dr. Hemenway seems to think, would it not have attacked members of the family at home and not waited until Mrs. Hammond returned?"

Dr. Wm. H. Andrews, health officer of Clyde township, Allegan county, writes of diphtheria in his jurisdiction during the month of September:—

"A girl, seven years old, came from Connecticut with her mother to our town to visit relatives. On their way here they stopped at Jackson, I think to attend a camp meeting. They remained two or three days, then came on. The girl complained of not feeling well, and on her arrival here grew rapidly worse. A physician was called who pronounced the disease malignant diphtheria and notified me. The child only lived a few hours after the physician saw her, and was dead before I arrived. I immediately fumigated the house, bedding, etc., and followed up the precautions thoroughly, and although other children had been in the house during the time, as well as neighbors, no other case appeared, though we had the whole crowd under preventive treatment. The girl arrived September 28, 1885, and died October 3, 1885."

John B. Bouret, health officer of Clement township, reports concerning an outbreak in the months June—July, as follows:

"The disease was brought here in old clothes taken from a lumber camp in the township of Edwards, Ogemaw county. The clothes were brought by a poor man whose wife was taken with a sore throat, but no attention was paid to it until the next one was taken sick which the doctor pronounced diphtheria."

An outbreak was reported in Butler township, where the disease was supposed to be "imported from Quincy in clothing of a person who had nursed a patient there."

Wm. M. Preston, M. D., health officer of the township of Charlevoix, reports concerning an outbreak of three cases, two deaths, Dec., 25, 1884, Jan. 3, 1885, as follows:

"But one family has been afflicted thus far, and it is not likely that there will be further contagium. The family cat died two days after the first case was taken down, and from what the family tell me of its condition, I believe it died of diphtheria." "The cat spoken of above had been sick for a week or more when the first case came down, and it was almost a constant plaything for the children,—this I did not know till after the cat had been carried away in the woods and could not be found."

This report tends to confirm the opinions of observers who have believed for some time that diphtheria was a disease capable of being conveyed from animals to man. Emmerich has pointed out the apparent identity between the bacillus of diphtheria found in man and in fowls.* Dr. Nicati has successfully inoculated various animals with the false membrane and showed that the outbreak among the fowls coincided with an increase of diphtheria among the inhabitants of the city.† Dr. C. J. Renshaw in an article‡ stating conclusions drawn from one hundred cases of diphtheria, after speaking of successful experiments made in administering the greyish-white membrane to cats, says:—

"It is by these experiments proved that diphtheria may be communicated from man to animals. Is not the converse just as probable; may not some of those mysterious attacks of diphtheria, which we all come across in practice, be conveyed by a favourite cat or dog to the patients? And does it not suggest to us, in all times of epidemic, the advisability of our preventing, as far as possible, that habit of fondling our domestic animals, which is so common amongst us?"

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* Trans. Vme. Cong. Int. d'Hyg., 1884, and Archiv. für Hygiene, 1885.
† Monthly Circular, California State Board of Health, June, 1885.
‡ The Practitioner, London, January, 1885, pp. 13-22.

Dr. David H. Wood, health officer of the village of Quincy, reports of an outbreak of 26 cases and two deaths from September 16 to October 14:—

> "In the month of August last there occurred two cases of sore throat in this village, one of which proved fatal (patient a child of three years). I suspected from random reports that it was a case of diphtheria, and acting on that suspicion had the house fumigated. School opened September 7, and in the room where the children from the above-mentioned family attended came the present outbreak of the disease."

H. N. Cargill, clerk of the Board of Health, Grand Rapids, made the following report of diphtheria in his jurisdiction during the month of September:—

> "You will notice by accompanying report that two deaths from diphtheria are given. They were of a mother and child. The child was taken first about 2 weeks ago, while the mother was in St. Paul, Minn. When it was found that the child was likely not to recover, the mother was sent a dispatch to come at once if she wished to see the child alive. She arrived about 12 hours before death occurred, and in the fondling—those that were present said that she kissed him—she was taken down within twenty-four hours, and this morning at one and one-half o'clock she died. Two physicians attended her, but they could not save her. She was twenty-eight years, and the boy five years of age."

A severe epidemic of diphtheria having occurred in Caro, Tuscola county, during the fall of 1885, and suspicion having been cast upon the water of the school well, the school board voted to send a sample of the water to Prof. James H. Shepard, Ypsilanti, Michigan, for analysis. Five gallons were sent and analyzed by Prof. Shepard who comments on the analysis as follows:—

> "It is my opinion that the water is very bad, and while I cannot undertake to say that the epidemic, diphtheria, actually did originate in this water, I will say that the water is bad enough to have given it origin or to have caused it to spread." "4. The albuminoid ammonia indicates that the water is heavily charged with organic matter. A good water may carry about .08 parts per million. This has .558 or about *seven times* too much to be safe. 5. This water carries the largest amount of nitrites of any sample ever analyzed in my laboratory, and these plainly point out sewage or filth as their origin. On account of 4 [albuminoid ammonia] and 5 [nitrites] I must condemn this water. 6. This is a large residue. It blackens on heating, pointing plainly to much organic matter. 7. [Iron (ferrous condition) strong test.] Whence comes this iron? Is it from copperas that you have thrown into the privy vaults? Or does your water-supply come from a marsh? There is more iron here than should be found in ordinary surface water." The Caro Jeffersonian states that "In explanation of the iron found it may be said that the grounds have been repeatedly disinfected by the use of copperas, and the porous nature of the soil is well illustrated by the traces found in the water, and we may certainly ask the question, 'Why can not other deleterious substances pass through the soil into the well.'"

After the analysis by Prof. Shepard, the school board immediately met, accepted the analysis and ordered the well closed.

An outbreak of diphtheria occurred in the city of Albion during the month of September, 1885, which presents some interesting points. H. D. Thomason, M. D., health officer of the city, reports concerning this outbreak as follows:

> "Two weeks ago Friday there were two bodies lying in a private vault in the cemetery, one a young lady who had died a week previous from intussusception of bowel. The remains were in a good state of preservation. A few days before a corpse was shipped here from the northern part of the state. It was placed in the same vault—the body of a woman 59 years old said to have died of jaundice. The local railroad men state that it was offensive at the station here. Without my knowledge it was placed in the vault. Two weeks ago to-day (Sunday, September 6) two girls, B. H. and one named C, visited the cemetery and went inside the vault for a few minutes. Several adults were in during the day and all claimed that there was a very offensive stench from the body shipped here and placed in the vault. The following Tuesday the C. girl left with her father for a visit among relatives in Vermont. The following Friday (five days after visit to the vault) B. H. was taken sick at school and went home. Saturday she consulted a lady physician in her office, who pronounced her throat diphtheritic and sent her home, where she was closely kept until her death the following Wednesday. Wednesday morning a despatch was received from Vermont stating that the C. girl

was taken with diphtheria Friday and had died Tuesday. I have been unable as yet to determine very definitely the history of the body shipped here. It came I understand from a town called Hersey. There were no relatives here, only distant acquaintances, and from them I learn that her death is attributed to 'black jaundice.' I will investigate further, if possible correspond with the attending physician, and try to get more definite facts. Whether these girls (each aged about 13 years) caught diphtheria from this putrifying corpse, or whether from the effects of a cold damp vault and inhalation of putrifying germs, were predisposed and contracted the disease elsewhere, is a question. It seems quite likely that they were exposed at or about the same time. * * * * Last week I had a case of tonsilitis and pharyngitis with considerable exudation over uvula and both tonsils, but I did not look upon it as diphtheria.'"

In reply to a question in a letter sent from this office, as to whether or not there was any relation between the case of diphtheria and the case diagnosticated tonsilitis, Dr. Thomason replied as follows:

"I will state here that this case of tonsilitis was in company with the girl who died in Vermont, September 4, and both were in excellent health apparently on that date,—the case of tonsilitis not being at all sick until the evening of the 8th, and the girl who died in Vermont being taken sick on the cars September 9. The H. girl who died here, as accurately as I can learn, was not in contact at all with the tonsilitis. There have been numerous bodies at different times placed in this vault (though it is a private vault) but none that died of diphtheria."

Dr. W. D. Neville, health officer of the village of Hersey, (from which village the dead body was brought) who granted the certificate allowing the remains to be removed from Hersey, in reply to a communication sent from this office, reported as follows:

"The said Mrs. W. did not have typhoid fever at the time of her death, nor did she present any typhoid symptoms during her illness. There was no diphtheria in Hersey or hereabouts at the time named, nor has there been for the last year, during my stay here, or for two years, I am told, previous. She did not have a sore throat at any time while she was sick, and never has had to my knowledge."

HOW LONG WILL THE CONTAGIUM REMAIN ACTIVE?

An outbreak of diphtheria in Romeo, Macomb county, was reported by Dr. J. P. Letts, health officer, and Dr. Wm. Greenshields, attending physician, where the source of contagium was brought in the clothing of visiting relatives, from Adair, St. Clair county. Dr. Letts writes concerning this outbreak as follows:

"The parties had had diphtheria in their own family and lost two children. It is now one month since their death. This goes to show how long the contagium can be carried and produce diphtheria,—one month after the death of the children and carried a distance of over 40 miles."

An outbreak was reported in Weare township, Oceana county, in the month of June, in the "same neighborhood where cases occurred last spring. The patient probably caught the disease by being in and about houses where those occurred last Spring."

Other outbreaks were reported as follows: "No exposure known unless it was associating with some youths who had it three months before he came down with it." "In same house where outbreak occurred last January" (four months previous). The disease "broke out where they had diphtheria the year previous and they had not properly disinfected." "The family had diphtheria two years ago and lost one child which was a twin sister to the one convalescent, and I think they were not properly disinfected then and have been using some of her clothing for this one." "The outbreak started in an old house where four years before they had had dipththeria." "By moving old rubbish where disease prevailed two or three years before." "Supposed to originate from disease germs remaining from a severe outbreak which occurred three years ago, as it occurred in the same vicinity but not in the same house. No member of the family had been out of the neighborhood for months, and it can be traced to no other source." "Was a case like this one in same family four or five years ago, and they have not been away nor has there been a case near them." In such cases as these some people are led to believe that outbreaks are sporadic,—disconnected with any outbreak that has gone before,—a case of "spontaneous generation;" but experience teaches that it is not impossible that the disease germs have been lying dormant, external to the body for months or years ready to "develop under the stimulus of some particular atmospheric conditions or when a suitable nidus presents itself."

A mild epidemic of diphtheria occurred at the Institution for the Deaf and Dumb at Flint, from October 28 to December 10, in which there were twenty-seven cases and no deaths. Dr. A. A. Thompson writes concerning this outbreak as follows:

"We are all surprised, as the sanitary measures initiated and completed during the last two years ought to have made everything favorable to health. We did not have a case last year. We think it is probably the result of the new style of heating. For several years the institution was heated by coils, but this was not satisfactory, and during the last vacation steam heaters with hoods over them were placed at the base of the old heat flues in the walls of the building, which all ventilated from the rooms into the attic. In these flues which had not been used for years were probably lodged some of the diphtheritic germs of years gone by." It is significant that "most of the pupils attacked are first year pupils." The school opened the 28th of October and the first case occurred November 8.

Diphtheria occurred in the township of Taylor, Wayne county, which was "Supposed to be taken from dusting and cleaning a lounge upon which two children died with diphtheria two years ago."

It thus appears that the germs of this disease are by no means of so weak and fleeting a nature that they lose their power and virulence as soon as they issue from the system of one infected with the disease. It seems probable that not only may the disease be contracted without any personal contact between an exposed and an infected person; but cases like those mentioned above have also been cited by other medical writers, where a family has been attacked by a contagium one to three years old. The evidence is that the germs of diphtheria will linger in the bedding, the hair and clothing of the patient, be carried a long distance by visiting friends, lodge in the flues and cling to the walls of the house, enter the home perhaps with the family cat, congregate in poorly ventilated churches and school-houses, emigrate from one city and colonize in another, linger about the clothing and playthings of children, as dangerous after months and years of rest as at the moment when they emanated from the infected person. The disinfection of everything about the premises of a place where diphtheria has occurred is, apparently, of much greater consequence than after the occurrence of any other disease which afflicts the people of Michigan.

DIPHTHERIA MISTAKEN FOR OTHER DISEASES.

Diphtheria has gone by many aliases, such as "tonsilitis with exudation," "only a severe cold accompanied with sore throat." An outbreak of diphtheria was reported in the village of Armada, concerning which the health officer writes as follows:

"A lady with three children came here from abroad to visit. The children all had what I think to be ulcerative, possibly membranous, sore throat. No physician was summoned, and I only judge from the history. The young man who had diphtheria was uncle to the children, and resided at the house where they were visiting."

One reports:

> "Seven cases of diphtheria reported to me as health officer of this village; upon investigation only one proved to be diptheria."

Another health officer writes:

> "I have seen several with 'patches' on the tonsils and fauces, but I do not believe 'patches' make the disease. It does not spread in a family nor does it make the patient very sick, and they are better too soon to let me believe it is genuine diphtheria."

The Detroit *Evening Journal*, August 31, 1885, recorded the death of a boy in Kalamazoo from diphtheria, stating that "A prominent physician pronounced the lad ill of bilious sore throat up until two hours before death."

James S. Reeves, M. D., health officer of the township of Baldwin, Iosco county, reports an outbreak of diphtheria in his jurisdiction in a family living in Grant township. This family visited in Tawas City at the house of a family lately afflicted with diphtheria, and on their return to Grant township a child became ill and (there being no doctor in Grant township) was taken to a physician in East Tawas "who told them that the child had a bad cold." He later pronounced the disease quinsy, and the child was taken to a boarding house in East Tawas. The health officer speaking of this outbreak continues as follows:

> "The mother of the child complained of her throat at the time, and was too ill to care for the child; a young German girl who worked at the boarding house was with it, carried it and gave it medicine, and began to complain of her throat. They all grew worse and the doctor still called it quinsy, but he became alarmed and went and examined them, and then told the lady who kept the boarding hall that it was diphtheria but to say nothing about it as her boarders would leave her. She kept quiet. The child died on the 4th, and the father said if his wife died he would shoot the doctor. He called Drs. Darling and Vaughan of Tawas City to treat her. On the fifth of July they reported three cases of diphtheria at this boarding house (one dead) * * * * The German girl took to her bed on the 6th of July and died on the tenth, and was immediately buried under my supervision. Six cases have been reported since, but they have been so mild that the people of the neighbourhood refused to believe that they were diphtheria and they did as they pleased. I examined all the cases and found them to be diphtheria."

One physician writes concerning a contagious disease in his village, and continues as follows:

> "There have been two deaths in one family under the care of another physician who persists in calling the first case membranous croup and the second case diphtheria. The family have all been sick with the disease, but the physician says only the second case (that died) in the family was diphtheria,—all the other cases were gaining (except the first). I have reported nine cases of this disease as diphtheria, all recovered. The health officer, accompanied by the other physicians, has seen a few cases and they pronounce them tonsilitis with no sign of diphtheria, and censure me severely for reporting the cases and causing such an unnecessary fright to the good people of the village. Now please tell me what to do in the case."

In reply to this letter the following communication was sent from this office:

> "In matters of quarantine, disinfection, etc., it is always safer to give the public health the benefit of the doubt, and treat cases which are suspicious and resemble diphtheria as such. In case they do not turn out to be diphtheria no harm has been done beyond what little may result from personal restraint; and in case they do prove to be diphtheria great danger of public exposure has been thereby avoided. The health officer is perfectly justifiable in treating all suspicious cases in this way. From your description I think the cases described were diphtheria."

May 26, 1885, the Detroit *Post* contained mention of seven cases and two deaths from diphtheria in the village of Concord. The health authorities of Concord were at once communicated with and the health officer replied that it was an outbreak of tonsilitis, that there had been two deaths, and that the physicians said that there had "been no cases of diphtheria here but diphtheric." In reply the following letter was sent from this office June 5, 1885:

"I know no form of tonsilitis or 'diphtheric' that is fatal. By your letter I judge that the disease really diphtheria, mild in adults and fatal to children. I hope that you will take prompt and effective measures against the further spread of the disease. By a resolution of this Board it is declared to be the duty of health officers to take the same measures for prevention in suspected cases of diphtheria as in undoubted cases."

In reply to a letter from the health officer concerning the methods employed by the local health authorities of Concord to stop the spread of the disease, the following letter was sent from this office:

"It is best to consider all cases of sore throat as possible diphtheria, and in such cases to give the public the benefit of the doubt. January 10, 1882, this Board passed the following resolution, which expresses its views on this subject:—

'WHEREAS, It is often difficult to recognize mild cases of diphtheria, or to distinguish such cases from a simple pharyngitis, or larynzitis;

'AND WHEREAS, Such mild cases of diphtheria often communicate a dangerous and fatal form of diphtheria;

'*Resolved*, That it is the duty of physicians and householders in reporting diseases dangerous to the public health, and of local health authorities in their efforts to restrict such diseases, in every case to give to the public safety the benefit of the doubt;

'*Resolved*, That suspected cases of dangerous diseases should be reported, and precautionary measures should be taken.'"

For some reasons, mild cases of diphtheria are more dangerous than malignant cases because they are "apt to assume a chronic course without losing their contagious nature." According to A. Jacobi, M. D., "*There is as much diphtheria out of bed as in bed; nearly as much out of doors as in doors.* Many a mild case is walking the streets for weeks without caring or thinking that some of his victims have been wept over before he was quite well himself."* The malignance of this disease is governed by the age of the person attacked rather than the malignancy of the case from which the contagium came. Thus it is that mild cases in adults may beget severe cases in children, while severe cases in children may beget mild cases in adults, the degree of severity depending on the soil not the seed. Probably in many cases reported as "sporadic," the contagium has come from adults attacked with a mild form of diphtheria,—so mild as to entirely escape attention or only to be named "simple sore throat."

"It is certain" says Chas. H. S. Davis, M. D., "as I have seen it in my own experience, that under the same endemic and epidemic influences, a case of catarrh, a case of croup, a case diphtheria, and a case of follicular inflammation of the tonsils may appear in the same family, and in the same week, and that catarrh on one side and diphtheria on the other, are but the starting and terminating points between which all the different shapes and forms may be registered according to their dignity, their modification depending on individual, lôcal, endemic and epidemic influences. * * * From our present standpoint, whenever we find an idiopathic membranous inflammation of the larynx, it seems proper to regard it as a case of diphtheria. It certainly would be rash to allow the precaution considered necessary in cases of diphtheria to be neglected." †

Wagner asserts "that the distinction between croup and diphtheritic inflammation is really one of degree."

Oertel who, with Hueter, was the first to discover that the diphtheritic membranes and the blood contained bacteria ("micrococci"), maintains that, in the early stages of diphtheria, it is impossible to make a certain diagnosis or to separate it from membranous croup. He says: "I believe that I have furnished, by a series of experiments, the proof that diphtheria begins as a local disease, and develops afterwards into a general one; and that, moreover, the general infection is kept up by the local one. * * * According to the results of the same investigation we must consider croup as a simple form of inflammation, in which a fibrinous exudation occurs upon the mucous membrane, and which can never pass the bounds of the local process. Finally an inflammation of the mucous membrane, with fibrinous exudation—or croup—can be induced by diphtheria, as well as by other influences in nature, such as atmospheric conditions, physical and chemical causes of irritation, etc.[*]

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*New York Medical Journal, Vol. 40, p. 344.

† Diphtheria and its Treatment, by Chas. H. S. Davis, M. D., p. 10-11.

Drs. H. C. Wood and H. F. Formad, in their report to the National Board of Health of their experiments with diphtheria, (which report embraces a study of the epidemic at Ludington, Mich., during the spring of 1881) conclude thus:

"Every grade of case can be found in man from an ordinary sore throat, through simple pseudo-membranous angina and trachitis up to malignant dipththeria. * * *

"A case may begin as one of sthenic 'pseudo-membranous croup' and end as one of adynamic 'diphtheria' with blood-poisoning; * * * * When diphtheria is thus epidemic the micrococci light upon a throat, and if the throat have little resisting power, as in the child, inflame it or increase a catarrh already existing into a violent inflammation, and also rapidly enter the blood and cause systemic poisoning."[†]

G. G. Tyrrell, M. D., Secretary of the State Board of Health of California, makes the following suggestion: "The evidence being thus strong in favor of the unity of Croup and Diphtheria, it might be well for medical men in general to adopt this view, as by so doing they will be much more apt to use those methods of isolation and disinfection which are so efficacious, and so necessary in diphtheria to prevent its dissemination. If we look upon croup as merely an inflammatory disease, the product of exposure to cold, etc., and non-contagious in its nature, we are sure to be lax in our sanitary environment of the patient and permit the access of those whose presence can do no possible good, and who may be the means of carrying contagion to uninfected persons."

MEASURES TAKEN TO RESTRICT DIPHTHERIA.

There were reported to this office fifty-two outbreaks where patients were isolated and houses were disinfected. In forty-one other outbreaks, patients were reported to have been isolated; and in seven other outbreaks houses were reported to have been disinfected. Where houses were reported to have been disinfected the report in most cases was so worded as to lead to the supposition that fumes of burning sulphur was the disinfectant used. In seven outbreaks the methods used to prevent the spread of the disease were reported to be the "usual methods recommended by the State Board of Health."[‡] In these outbreaks there were, all told, only fifteen cases including five deaths, or an average of about two cases to each outbreak.

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[*] Ziemssen's Cyclopedia of the Practice of Medicine. Vol. I. p. 577-578.

[†] Report National Board of Health, 1881, p. 64.

[‡] Briefly stated, the methods recommended by the State Board of Health, are the thorough disinfection of rooms, in which cases of diphtheria have occurred, with burning sulphur at the rate of 3 pounds of sulphur for each 1,000 cubic feet of air-space; the reception of discharges from the throat, nose, mouth, bowels and kidneys in a strong solution of copperas, or on rags which shall immediately be burned. If local health authorities would specify just what methods were used they would greatly facilitate the work of learning the value of the methods employed.

Other reports were received as follows: "School closed and intercourse with neighbors stopped," "we are leaving no stone unturned to prevent the spread of the disease," "every precaution has been taken to prevent its spread," "notices posted." "no communication with the outside except through the physician and an attendant employed for that purpose, and he was not allowed admittance to the house," "board of health used all precautions to prevent the spread of the disease—only one case." "isolation,—burying the dead privately and at night," "no visitors were allowed, and the child was buried direct from the house," "a great deal of clothing, bedding, etc., used around sick, we burned;" "the house in which the patient lodged being at a distance from any other, nothing was done except to keep all members of her family as much away from her as possible. One or two of the younger members were kept away entirely;" "I also stopped the district school, the Sabbath school and meeting at the church. I went to every house where the disease was, and posted written notices to the effect that diphtheria was in the house. I have not heard of any new cases."

Dr. A. W. Troupe, health officer of the village of Springport, Jackson county, reports concerning an outbreak of one case and no deaths in his jurisdiction during the month of July as follows:

"Immediately on the discovery of the disease the patient was isolated and no one but the nurses allowed in the house, and visitors were kept from the premises. The house and outbuildings were well disinfected, as was also the clothing, etc. The excreta were buried or burned."

S. H. Culver, M. D., health officer of the city of Mason, writes of an outbreak in his jurisdiction as follows:

"As soon as aware of the presence of the disease prompt isolation was enjoined, a plain sign denoting the presence of the disease was placed on the house. The copperas solution was used freely about privy-vaults and chlorinated lime about rooms. In case of recovery or death sulphur was burned in the closed rooms, which were afterwards opened. Attempts were made to follow as closely as possible the rules as presented in pamphlet from State Board of Health. The success of the efforts at restriction was generally good,—the greatest difficulty coming from those who yet maintain the disease is 'not catchin'.'"

A. D. Hurlbut, M. D., health officer of the township of Lee, Allegan county, reports the following measures taken to restrict the spread of diphtheria in his jurisdiction: "Closing school (second case occurred in school room), placing an efficient man in house where first four cases were, to care for patients and enforce isolation by keeping away visitors, * * * with the usual disinfection of rooms, bedding, clothing, etc."

Dr. A. M. Elsworth, health officer of the village of Lowell, Kent county, reports concering an outbreak during the months Sept.—Oct. as follows: "As soon as I was notified, the rooms were placarded, all persons were directed to keep out of the house, except the physician and enough to give the sick proper care. The first case died and was buried in the night after business hours, and only enough took part in the funeral to bury the corpse. The house was kept thoroughly disinfected with all the disinfectants that we could use, lime was also scattered on outside of premises."

V. F. Huntley, M. D., health officer of the township of Lake, reports concerning measures taken to restrict the spread of the disease in his jurisdiction. "The house was quarantined as much as possible and there were no carpets on the floor. The clothing of the family was removed from the lower part of the house and sulphur burned every day in the rooms. The discharges were disinfected and destroyed."

H. F. Ewers, M. D., health officer of Union City, writes as follows concerning a case of diphtheria in his jurisdiction: "On examining the premises I found a foul privy within three feet of the back door,—the foul gases entering the back part of the house." "There was no vault under the privy but a box which had not been emptied for some time. Copperas and lime were used freely and the house for a week was disinfected with sulphur burned early in the morning."

Other reports similar to the two last cited where disinfectants were used during the occurrence of diphtheria have been received as follows: "Fumigated the house twice a day with sulphur." "Disinfected room all that was possible with sick in it," "kept disinfectants constantly exposed in sick room," "sulphur was burned in the room adjacent to the sick room once a day." Many physicians seem to think that fumes of burning sulphur in small quantities in the room where the patient is do, in some way, lessen the malignancy of the disease, and tend to lessen the danger of the spread of diphtheria. On the other hand the report of the committee on disinfectants of the American Public Health Association, 1885, (p. 134), states: "It is an axiom in sanitary science that *it is impracticable to disinfect an occupied apartment*, for the reason that disease germs are not destroyed by the presence in the atmosphere of any known disinfectant in respirable quantity." It is possible that diphtheria may be exceptional, because of the poison being located on a moist surface on which the fumes of sulphurous acid may be dissolved; but this State Board has never recommended the attempt to disinfect an occupied room.

Some outbreaks were reported where so-called "disinfectants" were used to prevent the spread of diphtheria, which are not recommended by this Board or recognized by sanitarians as reliable disinfectants. One health officer reports "kept a quantity of tar on each stove in house boiling in water all the time." Another reports "All cloths or clothing were placed in boiling water, chloride of lime used freely, a vapor of carbolic acid was kept in the room by means of a spirit lamp—plenty of fresh air and sunlight." Another health officer reports the following methods of restricting the disease: "burning pine tar and spirits of turpentine, we recommend the use of chloride of lime and carbolic acid to restrict its spread." Another health officer writes that "all persons in attendance were required to take sulphurous acid internally." A large part of the confusion in the popular mind concerning the proper articles to use as disinfectants probably arises from confused ideas concerning the meaning of the word "disinfectant." It has been customary to speak of "disinfecting" foul cesspools and privies where no germs of any infectious disease were known to be present. To many people the terms "antiseptic" and "disinfectant" mean the same thing; but not all antiseptics are efficient disinfectants. Deodorizers are not necessarily germicides. Deodorizers may have no influence on disease germs; germicides or disinfectants destroy them; that is, disinfectants destroy the contagious matter or principle on which the reproduction of the disease depends.

Wynter Blyth, Medical officer of Health for Marylebone, England, discussing commercial disinfectants, says:

> "Rampant rides the quack in the fields, both of preventive and remedial art. Quackery takes a well-known common powder, labels it with a grand mystic name, selling bright copper at the price of gold. Quackery finds a stink outstinking feebler stinks and gives it forth as a disinfectant. Of all the substances gathered together under the name of disinfectants—solids, vapors, gases and odors—a small percentage alone possess any value."*

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* Report of the Committee on Disinfectants, of the American Public Health Association, 1885, p. 3.

The method of disinfection of rooms, clothing, etc., recommended by this Board is the exposure of articles supposed to be infected, for several hours to fumes of burning sulphur, of such strength as will be formed by the burning of three pounds of sulphur to each one thousand cubic feet of air-space in the room in which the articles to be disinfected are spread out and freely exposed to the fumes. Of this method of disinfection, E. Vallin, in his treatise upon disinfectants and disinfection, says: "Sulphurous acid, obtained by the combustion of sulphur in free air, occupies almost the first place among the veritable disinfectants."* Dr. Geo. M. Sternberg, chairman of the committee on disinfectants of the American Public Health Association, speaking of the conclusion of Wolffhügel that the use of sulphur dioxide as a disinfectant should be abandoned because it is not found to be effective for the destruction of spores, says: "I am not ready to go this length, and to recommend the abandonment of an agent which enjoys the confidence of practical sanitarians for the destruction of the infection of small-pox, of scarlet fever, of diphtheria, of cholera, and of yellow fever, upon the ground that it fails to destroy the spores of the anthrax bacillus or of *B subtilis*. * * * Admitting however, as I do, the great probability that the infectious agent in these diseases is a living germ, we have good reason for believing that spores are not formed in any of these diseases."† For the benefit of non-professional readers who may not be familiar with the subject, it may be said in this connection, that some "disease germs," as for instance, the *bacillus anthracis* which is now known to cause a dangerous disease, do form spores which are bodies still more minute than the "germs" themselves, and which resist the action of disinfectants which experience has shown are efficient to prevent the spread of small-pox, scarlet fever and diphtheria.

OUTBREAKS IN WHICH HEALTH REGULATIONS WERE NOT RESPECTED.

Diphtheria is believed to be a preventable disease; that it is not stamped out of Michigan is probably due to a lack, among all classes of people, of knowledge concerning the proper measures to use, and to the neglect to use measures which are known. From the annual reports of clerks and health officers, knowledge has been obtained of many outbreaks of diphtheria which were not reported to this office at the time of their occurrence. For example one outbreak of twenty-four cases, including three deaths, another outbreak of fifteen cases, five deaths, another of eight cases, eight deaths, and another of twenty cases, seven deaths, were reported to this office at the close of the year, but they were not reported at the time of their occurrence as they should have been that the State Board might coöperate with the local boards in their restriction. Perhaps in some cases the health officers themselves have not lived up to the law which requires the health officer to "keep the Secretary of the State Board of Health constantly informed respecting every outbreak of a disease dangerous to the public health;" possibly in more cases physicians have not obeyed the law which requires them to give immediate notice of any disease dangerous to the public health to the health officer, the president or the clerk of the board of health of the township, city or village in which the sick person may be; probably in yet more cases the people themselves did not obey the law which requires householders, hotel keepers, etc., who shall know of any case of a disease dangerous to the public health in their household to "immediately give notice thereof to the health officer, the president, or the clerk of the board of health of the township, city, or village in which he resides." But the reports of each of these three classes of persons are increasing in number and accuracy from year to year.

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* Report of the Committee on Disinfectants of the American Public Health Association, 1885, p. 68.
† Report of the Committee on Disinfectants, of the American Public Health Association, 1885, p. 87.

Some outbreaks have been reported to this office where isolation was only partially effected, as follows: "People would go in and out of the sick room into other houses and spread the disease." "The first information I had of it I saw a hearse with a corpse." "The isolation of the sick room was impossible, and all members of the family were constantly with the sick one." "The disease has prevailed in Tawas City since the spring of 1885, and no attention paid to the laws." "The attending physician did not notify me of the case." "The people were most all Germans. They would say it was not contagious and expose themselves unnecessarily." "The child, I think has had it, since the first of July, but not noticeable by the family because it has been located in the *posterior nares* [back part of nose.] The family have been at large until to-day, and on the fourth of July they had the child at Stanwood, where a great many people had gathered."

N. J. Cranmer, M. D., health officer of Breedsville village and Columbia township, reports concerning an outbreak of twenty-two cases and six deaths in his jurisdiction, as follows:

"On the appearance of a case I placarded the gate or door, and warned them how to disinfect after and before the close of the disease * * * * but they paid no attention to my orders. Some of the board of health who were in trade declaring there was no diphtheria in town. The people went so far as to tear down my notices, rendering its spread easy and sure. * * * * One half the people did not believe there was any diphtheria in town."

One physician writes:

"In regard to reporting these cases I have not because the health officer informed me he should not require it, and I do like the others here. We have a board of health only in name. To report a case of diphtheria or scarlatina would be a subject of criticism for months. Such is the standing of our board of health. I venture to say you can't get a report from them unless you come in person and interview them."

James Gibbs, health officer of Benona township, Oceana county, writes of an outbreak in his jurisdiction of thirty-eight cases and eight deaths during the months, June 11 to Oct. 25, as follows:

"Nothing was done to restrict the spread until September 5, when Dr. Thomas Phillips was called and pronounced it diphtheria; then, within a few days, Dr. Ransom Sabin was called and he also reported diphtheria to our township clerk. The township board just hooted at it, until September 21 I received a notice that I had been appointed health officer April 7, but that they had neglected to notify me, but wished me to act at once, which I did as best I could, the disease being then in six families. I at once quarantined every house that had been exposed."

One health officer writing of two cases and one death from diphtheria in his jurisdiction which had not been reported, said:

"Little or nothing had been done in the way of arresting or preventing the continuance or spreading of the disease. The health board desire to do their duty in enforcing the law. I have had some little experience in attempts in that direction. Three years ago complaint was made against three of them. The prosecuting attorney through sharp practice succeeded in preventing their ever coming to trial, at each term of court for one year. I made every effort to have them tried. From my experience I did not wish my present office,—accepted at the urgent solicitation of friends. I now find myself in a dilemma, either resign or prosecute. * * * * I would like to hear from you before I commence."

In reply to the above letter the following communication went from this office:

"The law does not make it the duty of the health officer to prosecute, but only 'forthwith to give notice thereof, in writing, to the prosecuting attorney of his county' * * * * Section 6855, compiled laws of 1871, requires the prosecuting attorney to prosecute for any forfeiture within his county. * * * * If he neglect his duty, he alone is responsible."

One health officer writes of four cases of diphtheria discovered in his jurisdiction, Jan. 11, 1885, as follows:

"The death led to the discovery of diphtheria. The house is the next one to that where two children died in December, 1884. The attending physician did not like to excite the fear of the public by reporting the cases, as they were very light. The attention of the prosecuting attorney has been called to the neglect of the physician, and he promises to prosecute."

Dr. A. G. Bush, health officer of the township of Campbell, in a letter dated Oct. 31, 1885, stated as follows:

"A hired man at one of the families where diphtheria has occurred is obliged to go through the room where a child is sick with the disease to get to his sleeping-room each night and morning. Should such a person be allowed to drive or go through the streets of a village and be sent to market with produce, or should he be considered infected and isolated?"

In reply to the above letter a communication went from this office stating that diphtheria was believed to be often spread by adults who had only slight sore throat but who conveyed fatal diphtheria to children, and that the person referred to should be isolated till all danger of his spreading the disease was over.

Information having reached this office that three deaths from diphtheria had occurred in a certain city, and that a public funeral had been held in which six little girls acted as pall bearers, a communication was at once sent from this office to the health officer expressing the hope that no more public funerals would be allowed or such exposure of little children permitted. In reply the following communication was received from the health officer:

"The facts are these:—One of the patients belonged to me. In this case there was no public funeral at the house or church. None were present but the family at the burial. All the cloths used about her during her sickness were burned. Nothing was saved but a new mattress between which and her person there was always bed-clothing and a straw bed. The house was strongly fumigated with burning sulphur. The rest of the cases in the family have recovered, so I have ordered another thorough fumigation, and also ordered the woman to wash the paint and mop the floor all over the house with a solution of carbolic acid—two teaspoonsfull to a pail of hot water. All the clothing worn by the patients during their sickness will be burned. A sign was upon the house from the beginning, and will be until the disinfection is completed.

"The other cases to which you referred were in the practice of another physician. They were not reported. I did not know that the first death had occurred till after the funeral, and in the second case I met the funeral coming from the church * * * * Several years ago the health officer arrested a physician for not reporting two or three of his cases of scarlet fever * * * * * Every one turned their backs upon him (the city-physician) and left him alone and he failed. Most every one in the city said it was a case of spite * * * * I have injured my practice by standing by sanitary regulations, since others do not. I have done my best to arouse the authorities to a realizing sense of the necessity of enforcing the law, but I do not intend to stand alone and thrust my head against a stone wall just for fun.

"The family I attended received the contagion from a family living next door. The latter cases were not reported, neither was there a sign on the house. I spoke to one of the aldermen about it, but he thought best to leave it alone."

On receipt of the above letter a communication was sent to the mayor of the city, who replied that he thought the physician who had been criticised intended to comply with the regulations of the local board of health, that he had informed the family of the law concerning holding a public funeral, and also the priest, and that he had reported to the city marshal. In reply a letter went from this office to the mayor stating that if the physician "had notified the proper officer, namely, the health officer, *the funeral could have been prevented,* as it is by law the duty of the health officer to supervise funerals of persons dead from diphtheria."

A letter dated Oct. 29, 1885, was received from John Mick, supervisor of the township of Campbell, Ionia county, stating that a certain physician had come before the board of health and claimed that diphtheria was not contagious and "that he himself used no precautions." The writer asks "if physicians can go from house to house without use of precaution, why should any one be isolated?" and inquires "Should it not be the duty of every physician in attendance on persons sick with diphtheria to use all precautions on behalf of their own persons?" In reply to this letter, a communication was sent from this office Oct. 29, 1885, as follows:

> "The local board of health, under Section 1695 of the Compiled Laws of 1871, has power to make rules and regulations in regard to communicable diseases. Under section 1698 of the same, the rules and regulations must be published. Then if any one violates them, he is liable to a fine of one hundred dollars or less. I send you a pamphlet with those sections marked, on pages 7 and 8.
>
> "I would advise your board to make and publish a few rules governing the isolation and care of persons sick or dead with communicable diseases, and then enforce them. Without such regulations I do not see how the doctor you mention can be touched unless you leave your health officer to act under Act No. 137, Laws of 1883, a copy of which I also send you by this mail. In the absence of regulations made by the board, this act empowers the health officer to look after the isolation, disinfection, etc., and whoever violates his orders made in pursuance of his duty under that act 'shall forfeit for each such offence a sum not exceeding one hundred dollars.'
>
> "There is one other way in which the subject may be dealt with, namely, by establishing a hospital as you suggest in your letter, at the place where the sick person is. I think, however, that you will need to publish the fact that your board considers every house in which there is a person sick with diphtheria a 'hospital' under the law, and will enforce the regulations which you publish respecting such hospitals."

Sumner Russell, health officer of Odessa township, writes of an outbreak during the month of November as follows: "It appears that they had the diphtheria in the same house last summer, and, by what I can hear, they did not disinfect the house at all."

Here were three deaths from diphtheria which, in the opinion of the health officer, were caused by the neglect to disinfect a house where diphtheria had occurred a few months before, and this is one reason why diphtheria is not stamped out of Michigan. The report of the committee on disinfectants of the American Public Health Association, 1885, (p. 130) has this to say of the necessity of thorough disinfection:

"*In the sick room we have the disease germs at an advantage, for we know where to find them as well as how to kill them.*" "Having this knowledge, not to apply it would be criminal negligence, for our efforts to restrict the extension of infectious diseases must depend largely upon the proper use of disinfectants in the sick room." This does not mean the use of fumes of burning sulphur "in the sick room" while occupied; but the use of such fluid disinfectants as solutions of corrosive sublimate or "chloride of lime," for the disinfection of the discharges from the throat, bladder and bowels, and the subsequent thorough disinfection of the room and contents, after the removal of the occupant by death or recovery.

SUCCESS OF EFFORTS FOR RESTRICTION OF DIPHTHERIA.

Fifteen health officers, who reported on the special final report blank that patients had been isolated and that houses had been disinfected, reported that the outbreak had been limited to one case. Nineteen others reported on the final report blank that the success of measures taken to restrict the spread of the disease had been "good"; four stated that they had met with "perfect" success; eight reported that they had been "successful" in restricting the spread of the disease. Measures taken to restrict the spread of diphtheria in other cases were reported to have met with the following success: "So far complete," "all that could be desired," "remarkably effective," "excellent," "confined to one family," "restricted to one house," "confining the spread of the disease to the two cases named," "that no new cases have come down with the disease although there were others in the house all through," "no new cases appeared after I was notified." In one case a daughter came home "about ten days after" the house had been disinfected (subsequent to a death from diphtheria) and was in a few days taken sick. In response to inquiry from this office the health officer stated that the privy had been disinfected(?) with "ashes and lime," neither of which is a disinfectant.

REMOVAL, AFTER A PERIOD OF YEARS, OF BODIES DEAD FROM DIPHTHERIA.

May 1, 1885, the following letter was received from George Winkel, supervisor of the township of Wheatland:

"Can dead bodies be removed from one burying place to another? There is some talk of removing the dead bodies of over thirty-five who died from diphtheria two or three years ago. Will it not be injurious to the public health to remove such bodies?"

In reply to the above letter the following communication was sent from this office:

"Your letter inquiring whether or not it would be injurious to the public health to remove the bodies of a large number of persons who died of diphtheria two or three years ago has been received. In my opinion it would probably be dangerous to disinter such bodies. In no case should such exhumation take place except in the presence of, or under the direction of, the health officer, and with the following precautions. In each case, when the grave digger has dug down to and uncovered the coffin, several pounds of sulphur should be burned in the grave lightly covered to retain the fumes (before removal of the coffin); after the coffin is removed it should be at once placed in a hermetically sealed box, and this should also afterward be disinfected. The persons who exhume the bodies should not be allowed to wear the same clothes as at their ordinary work, but the clothes which they do wear should be thoroughly disinfected afterward. They should not go near children for a few days. However, I think it would be safer to prohibit such removal altogether. It is not known how long it takes bodies of those dead from diphtheria to so decompose as to be free from infection."

In reply to a letter from the health officer of Watertown, asking the opinion of this Office concerning the proposed removal of two bodies dead from diphtheria five years previous, a communication went from this office stating as follows:

"The local board of health has power to decide whether the bodies shall be disintered or not. Diphtheria is more likely to spread in winter than in summer, and for this reason it would be better to remove the bodies in warm weather. There might be no danger from removal of bodies so long dead (five years) but it would be better not to remove them."

PERIOD OF INCUBATION OF DIPHTHERIA.

Eight health officers stated that the period of incubation in outbreaks under their jurisdiction had been noticed to be more than 2 and less than 7 days; twelve others reported the period to be 10 days or less; five fixed the period at more than 10 days; others observed periods varying widely, such as:—3 to 14, 3 to 17, 4 to 12, and 8 to 18 days.

Other health officers reported facts bearing upon the subject of the period of incubation as follows:—

"In most cases 3-5 days. In one case the mother was present at the death of a fatal case, and 'after going home' changed her clothing. On the eighth day afterward the disease was manifested in the daughter. Two cases (mild) occurred in this family. Many cases arose without apparent source of contact or exposure to the contagion." "Found one case where patient said she had been exposed two days, another three weeks, usually from 8 to 14 days." "It was sixteen days from the

> time that the case before this was reported well until this case came down. This young man went to work hard, evidently took cold, and whether the disease had been quiet from the time of the other cases and the hard cold was the exciting cause to bring it into action, or whether it was from want of disinfection, is perhaps not certain, although I lean to the latter opinion." "The first patient was taken sick July 16, died July 20. I was not notified, nor was a physician called until the child died. (They were Norwegian people who did not suspect the disease.) The other two were taken down July 21." "March 1 (or about that time) the family made the visit [to relatives who complained of sore throat]. March 3, I was called to see the mother of the two children. She complained of a tenderness of the throat * * * * March 7, I was called to see the first case; March 10, the second case was taken sick. The first case died March 10, the second died March 15." "No exact data can be obtained. When first seen the above cases were all sick. No physician was called and no report made of the cases for four days. After the disease made its appearance and when first seen the throats of all the children were affected, so that no opportunity was offered for observing the period of incubation."

Dr. E. A. Crain, health officer of the township of Butler, writes of an outbreak in the month of November as follows:—

> "Facts as to the exact period of incubation can not be accurately obtained except in the last case which occurred. The woman who had been attending her daughter in Quincy came from that place on the 17th, and on the 18th of November she hung some of her clothing on the line and it hung there for two days, and in the mean time some little ones played in that part of the yard, and on the 26th one that lived here came down, and the 27th one that was stopping in Clarendon came down,—both died."

The period of incubation as observed and reported by health officers to this office agrees largely with the opinion of other physicians. "According to Roger and Peter, it varies between two and eight days; but may, in the opinion of these observers, exceptionally cover a period of from twelve to fourteen days. According to Newmann the stage of incubation is usually very short—from two to three days; in no one of the cases observed by him did the time extend beyond seven or eight days."[*] Oertel places the period at from 2 to 5 days.[*] Morell Mackenzie, M. D., cites a case (girl, 6 years old) under his observation where the period of incubation could not have been more than twelve to sixteen hours.[†] Probably the period of incubation varies according to the power of resistance of the patient as well as the virulence of the infecting material. Furthermore, as the disease germs may linger in the clothing and hair sometime before being introduced into the system, it is difficult to determine the exact period of incubation, though the maximum limit of time may be known.

In some instances local health authorities have received from the office of the State Board of Health their first knowledge of the existence of contagious diseases in their jurisdiction, said information having been received at this office from physicians in other townships, newspapers, and other sources. Health officers have as a rule been quick to act on the receipt of such information. As an illustration of communications sometimes received from health officers, the following letter from Henry O. Whelan, health officer of Deerfield township, is printed:—

> "Yours of June 26 was received June 30 and was the first intimation that I had that diphtheria had made its appearance in this town. I proceeded yeterday to investigate and found it to be of a very malignant type. Two have already died and I think at least two more will die."

About 10,000 pamphlets issued by the State Board of Health on the "Restriction and Prevention of Diphtheria" were during the year 1885 sent in small quantities to the different localities where diphtheria prevailed. These pamphlets the health officers were requested to distribute to the neighbors of those sick with the disease, and they have been pronounced by health officers a great help in restricting the spread of the disease. If "the knowledge of a disease is half its cure," the knowledge of its method of spread is half its prevention. As a law cannot be enforced unless public sentiment is "behind the law," so the efforts of health officers at isolation and disinfection are rendered to a great extent profitless without the cordial coöperation of the people. Toward securing this coöperation, liberal use has been made of the circulars issued by this Board, and, it is thought, with very satisfactory results.

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[*] Cyclopedia of the Practice of Medicine. Ziemssen, vol. I, p. 594.

[†] Diphtheria; Its Nature and Treatment. Mackenzie, p. 29.

SCARLET FEVER IN MICHIGAN—YEAR ENDING DECEMBER 31, 1885.

Although the reports of sickness from contagious diseases received by the State Board of Health are not perfect, yet there has been a steady improvement from year to year, both in the method employed by the State Board of Health for obtaining reports, and in the pains taken by local boards of health to supply to the State Board this important imformation.

Weekly and special reports received at or near the time of the outbreak, special final reports received at the close of outbreak, and the annual reports received at the close of the year, show that there were 356 outbreaks in 337 localities, 2,750 cases, and 187 deaths from scarlet fever in Michigan during the year ending Dec. 31, 1885. From this it is seen that the deaths were seven per cent. of the cases, and that there were an average of eight cases to an outbreak.

The map on page 253 exhibits the number of outbreaks, cases and deaths from scarlet fever, and the number of localities in which they occurred in each county in Michigan, during the year ending Dec. 31, 1885. From this it is seen that from 21 of the 82 counties in the State, no cases of scarlet fever were reported. These 21 counties are as follows: Alger, Mackinac, Isle Royal, Ontonagon, Baraga, Iron, Manitou, Emmet, Montmorency, Alcona, Oscoda, Otsego, Benzie, Missaukee, Roscommon, Ogemaw, Gladwin, Clare, Lake, Mecosta and Midland. These are mostly new counties in which there is not rapid and easy railroad or other means of communication, which in other counties seem to spread contagious diseases. It will be seen, also, that six counties reported 1,422 cases, or more than all the other counties combined. These six counties, in the order of the greatest number of reported cases, are as follows: Wayne, 669; Saginaw, 215; Kent, 159; Kalamazoo, 146; Bay, 121; and Lenawee, 112 cases.

SCARLET FEVER IN 1885 COMPARED WITH 1884.

Comparisons with former years are not so satisfactory as they would have been had the reports of past years been as extensive and thorough as those of the present year, But the material on which the report for 1884 was based differs so little from the material for this report that comparison in this instance will be both interesting and valuable.

As already seen, during the year 1885 there were reported 356 outbreaks in 337 localities, 2,750 cases, and 187 deaths, the per cent. of deaths to cases being seven, and the average number of cases to outbreaks, eight. For the year 1884, there were reported 172 outbreaks in 144 localities, 2,476* cases and 230* deaths, the per cent. of deaths to cases was nine* and there were an average of nine cases to an outbreak.

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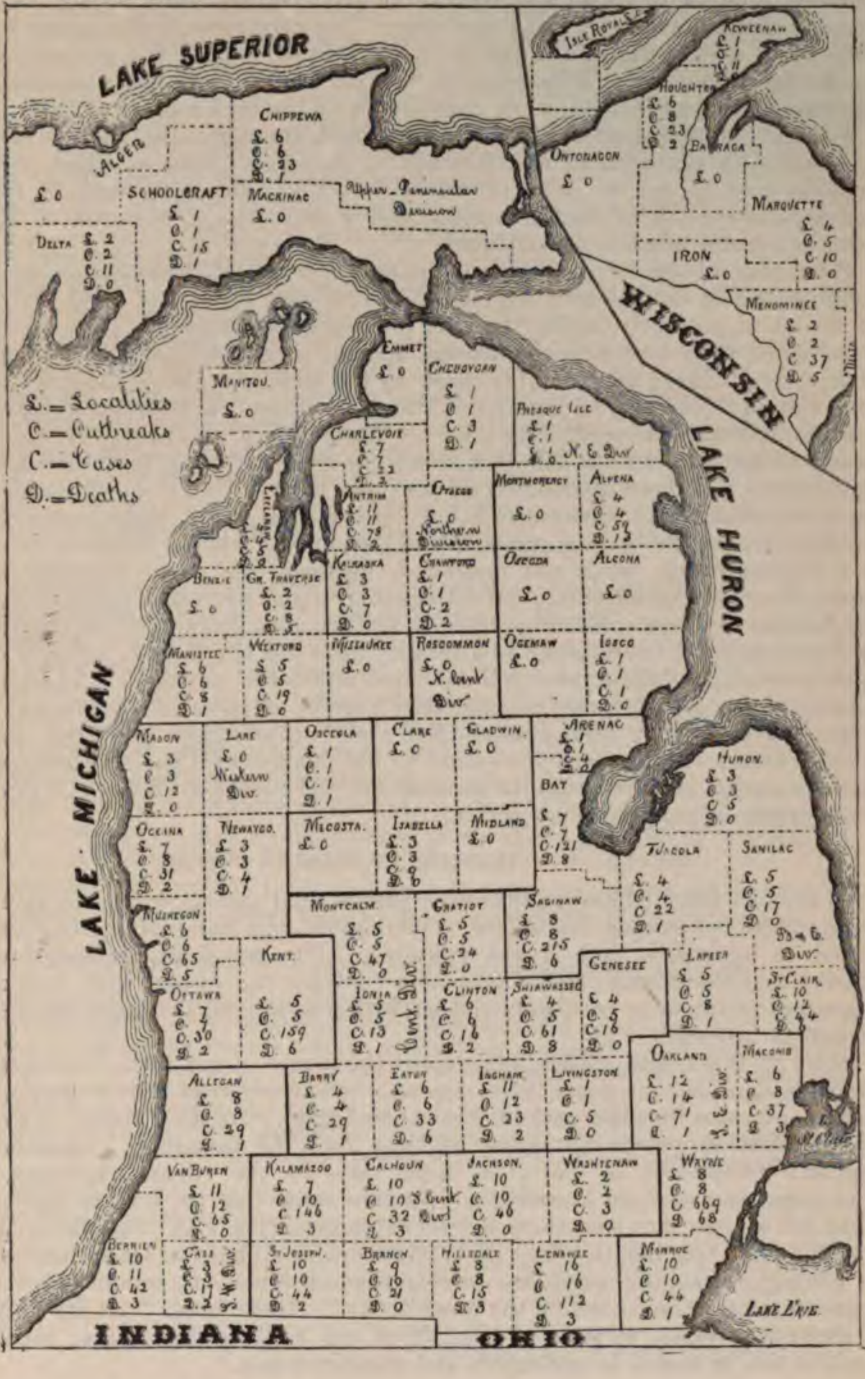
*The material for these figures includes the annual reports by health officers and clerks.

DISTRIBUTION OF SCARLET-FEVER REPORTED IN MICHIGAN IN 1885.


LAKE SUPERIOR
LAKE MICHIGAN
LAKE HURON
LAKE ERIE
WISCONSIN
INDIANA
OHIO
ISLE ROYALE
L. = Localities
C. = Outbreaks
C. = Cases
D. = Deaths
Upper Peninsular Division
KEWEENAW L. 1 C. 1 C. 11
HOUGHTON L. 6 C. 8 C. 23 D. 2
ONTONAGON L. 0
BARAGA L. 0
MARQUETTE L. 4 C. 5 C. 10 D. 0
IRON L. 0
MENOMINEE L. 2 C. 2 C. 37 D. 5
ALGER L. 0
CHIPPEWA L. 6 C. 6 C. 23 D. 1
SCHOOLCRAFT L. 1 C. 1 C. 15 D. 1
MACKINAC L. 0
DELTA L. 2 C. 2 C. 11 D. 0
MANITOU L. 0
EMMET L. 0
CHEBOYGAN L. 1 C. 1 C. 3 D. 1
PRESQUE ISLE L. 1 C. 1 C. 1 D. 0
N. E. Div.
CHARLEVOIX L. 7 C. 7 C. 22 D. 2
LEELANAW
ANTRIM L. 11 C. 11 C. 78 D. 2
OTSEGO L. 0
Northern Division
MONTMORENCY L. 0
ALPENA L. 4 C. 4 C. 59 D. 13
BENZIE L. 0
GR. TRAVERSE L. 2 C. 2 C. 8 D. 5
KALKASKA L. 3 C. 3 C. 7 D. 0
CRAWFORD L. 1 C. 1 C. 2 D. 2
OSCODA L. 0
ALCONA L. 0
MANISTEE L. 6 C. 6 C. 8 D. 1
WEXFORD L. 5 C. 5 C. 19 D. 0
MISSAUKEE L. 0
ROSCOMMON L. 0
N. Cent. Div.
OGEMAW L. 0
IOSCO L. 1 C. 1 C. 1 D. 0
MASON L. 3 C. 3 C. 12 D. 0
LAKE L. 0
Western Div.
OSCEOLA L. 1 C. 1 C. 1 D. 1
CLARE L. 0
GLADWIN L. 0
ARENAC L. 1 C. 1 C. 4 D. 0
BAY L. 7 C. 7 C. 121 D. 8
HURON L. 3 C. 3 C. 5 D. 0
OCEANA L. 7 C. 8 C. 31 D. 2
NEWAYGO L. 3 C. 3 C. 4 D. 1
MECOSTA L. 0
ISABELLA L. 3 C. 3 C. 9 D. 0
MIDLAND L. 0
TUSCOLA L. 4 C. 4 C. 22 D. 1
SANILAC L. 5 C. 5 C. 17 D. 0
S. E. Div.
MUSKEGON L. 6 C. 6 C. 65 D. 5
MONTCALM L. 5 C. 5 C. 47 D. 0
GRATIOT L. 5 C. 5 C. 24 D. 0
SAGINAW L. 8 C. 8 C. 215 D. 6
GENESEE L. 4 C. 5 C. 16 D. 0
LAPEER L. 5 C. 5 C. 8 D. 1
ST. CLAIR L. 10 C. 12 C. 44 D. 6
OTTAWA L. 7 C. 7 C. 30 D. 2
KENT L. 5 C. 5 C. 159 D. 6
IONIA L. 5 C. 5 C. 13 D. 1
Cent. Div.
CLINTON L. 6 C. 6 C. 16 D. 2
SHIAWASSEE L. 4 C. 5 C. 61 D. 8
OAKLAND L. 12 C. 14 C. 71 D. 1
3rd Div.
MACOMB L. 6 C. 8 C. 37 D. 3
L. St. Clair
ALLEGAN L. 8 C. 8 C. 29 D. 1
BARRY L. 4 C. 4 C. 29 D. 1
EATON L. 6 C. 6 C. 33 D. 6
INGHAM L. 11 C. 12 C. 23 D. 2
LIVINGSTON L. 1 C. 1 C. 5 D. 0
VAN BUREN L. 11 C. 12 C. 65 D. 0
KALAMAZOO L. 7 C. 10 C. 146 D. 3
CALHOUN L. 10 C. 10 C. 32 D. 3
S. Cent. Div.
JACKSON L. 10 C. 10 C. 46 D. 0
WASHTENAW L. 2 C. 2 C. 3 D. 0
WAYNE L. 8 C. 8 C. 669 D. 68
BERRIEN L. 10 C. 11 C. 42 D. 3
CASS L. 3 C. 3 C. 17 D. 2
S. W. Div.
ST. JOSEPH L. 10 C. 10 C. 44 D. 2
BRANCH L. 9 C. 10 C. 21 D. 0
HILLSDALE L. 8 C. 8 C. 15 D. 3
LENAWEE L. 16 C. 16 C. 112 D. 3
MONROE L. 10 C. 10 C. 44 D. 1

The 274 more cases and 15 more deaths reported in 1885 than in 1884 is probably due to more perfect reports in 1885, rather than to a greater amount of scarlet fever during that year. The card reports of sickness for 1885, show a decrease in the per cent. of reports stating the presence of scarlet fever, and, also, a decrease in the per cent. of observers reporting the disease present in 1885, when compared with the card reports of 1884.

From a comparison of the figures of 1885 with those of 1884, there is seen a decrease in the number of outbreaks in the same localities, which, it is possible, may be due to more careful disinfection; also, a decrease of two per cent. in the rate of deaths to cases, and a reduction of one case in the average number of cases per outbreak.

From this standpoint, there is an apparent decrease of sickness from scarlet fever, which may be attributable to the increased activity of local boards of health in promptly taking vigorous precautionary measures, such as the isolation of those sick with the disease, and the thorough disinfection of all articles of clothing and furniture used by the sick, and also to the growing information of the people, because of circulars on the "Restriction and Prevention of Scarlet Fever," issued by the State Board of Health, of which nearly 10,000 copies were distributed during the year 1885, in addition to those which had been distributed in previous years. But there is another cause which also may have contributed towards this result, and hence must not be overlooked. As was stated in the last annual report: "Scarlet fever is a disease which, when not restricted, decreases and then increases in waves, the crests of which are quite frequently about five years apart, probably because children under five years of age are most susceptible to the disease, and after all the children in a locality have had the disease, a period of time must elapse before there is a sufficient number of susceptible children present to permit of a very considerable number of cases of the disease." After the facts have been systematically and thoroughly collected and studied for a series of years, the extent to which efforts for the restriction of this disease are successful can be ascertained, and such knowledge will be of great utility in guiding future action.

SOURCE OF CONTAGIUM IN SCARLET FEVER.

Of the one hundred and eighty-seven special final reports which answered the question concerning the source of contagium, one hundred and thirteen stated in substance that it was unknown. The remaining seventy-four showed that the health officers were able to trace the disease with various degrees of certainty to contagium, either within or beyond the limits of their several jurisdictions.

Some of the health officers who report the source "unknown," indicate probable sources; one says: "Not known; but it occurred after a picnic," and he indicates that the patient was exposed then. Another states: "Not known; but supposed contagium brought into the township." Another replied: "Supposed to be from some cases in the village adjoining." One states, source "not known," and further states that the disease existed eight miles away, but that there was no communication with it so far as he could learn. One health officer said: "It is most difficult to trace the cases to contagium, as the cases are widely separated and no communication between the families in which the cases occur." One states: "At intervals of about two weeks, we seem to have from one to three new cases; sometimes it can be traced to contagium and sometimes not."

On Oct. 24, 1885, Dr. O. P. Barber, health officer of the city of Saginaw, wrote at length of an outbreak in that city, extending over a period of about three months, and in which occurred about 150 cases of scarlet fever. Concerning the spread of the disease he states: "These cases have occurred without any trace of communication in any single instance that I could discover." He mentions the scattered condition of the city, and that cases occurred here and there, miles apart, among entirely different classes of people, although isolation and disinfection were strictly enforced. In his remarks on the precautionary measures taken, he states: "The carpets, lounges, and all such articles of furniture, were removed from the sick room." If this is taken just as it reads, it would account for the spread of the disease; for he does not state that the furniture was disinfected. It is probable that the doctor intended to state that the furniture was removed from the room before the patient was placed therein.

Of the forty-seven health officers who stated the source of contagium, most report it as having come from localities near by, but in a few cases it was brought from distant places, as from Toledo, Chicago, Nebraska, etc.

To show the lack of definiteness sometimes manifest in the replies to the question regarding the source of contagium, the following may be mentioned: One health officer reports "local filth;" another, "local causes;" another, "filthy cellar;" one, "impure water;" another, "impaired vitality." Three reply "epidemic;" two, "endemic;" and two reply "sporadic."

The following extract from a letter, dated Nov. 28, 1885, from Dr. M. E. Bishop, health officer of the village of South Haven, has an interesting bearing on the source of contagium: "Last June one of Mr. More's children had scarlet fever. Strange to relate, but one of them had it. The 10th of this month the carpets were taken up, and Fannie, and Lulu, a cousin living near by, romped and played on them while in the yard. In a little over a week both of them were taken sick with scarlet fever. No precautions were taken after the case had occurred last June, and hence the outbreak nearly four months afterwards." It will be of interest to note the part this case plays in this outbreak, as given under the head of "Measures Taken to Restrict Scarlet Fever," in this article.

Under date of Aug. 11, 1885, Dr. John P. Corcoran, health officer of Linden, Mich., writes as follows relative to an outbreak in his jurisdiction:

Soms Facts relative to the recent outbreak of Scarlet Fever in Linden.

On or about the first of January, 1885, a former resident of Linden, then in Dakota for the benefit of his wife's health, started for their home in this vicinity, with his wife and infant child. Stopping in Chicago to rest his wife, who was then far advanced with consumption, the baby was taken ill with scarlet fever, although it was not so diagnosed on the start by the attendant physician. This was soon followed by the illness of both father and mother and the death of the baby, whose remains were kept a few days and then shipped here by rail. The father and mother also came home, and were accompanied by a christian minister from Chicago, who, seeing the helpless condition of both father and mother, accompanied them home to their residence in this vicinity, where the funeral of the baby was held.

All this time scarlet fever was unsuspected even by the physician who was called in to see Mrs. S. after the burial of the babe, and who in this case was myself.

On the 12th day of February I was called to see Zoe S., aged 6 years. Found her vomiting and complaining of sore throat, and on examination found a reddened and congested condition of the tonsils and throat, and I think, but am not certain at this date, with diarrhœa also. In a day or two the typical rash of scarlatina showed itself on the body, and the enlarged and reddened papillæ of the tongue showed there a white furry coat quite plainly, and the disease was then for the first time pronounced scarlet fever. Following this case the servant, a girl aged 16, was stricken, and in a day or two the mother also came down with this disease. Four other cases occurred with the advent of warmer weather in April or May, making in all seven cases. Strict isolation was practiced and the disease spread no further. The type was mild, and was followed by no serious results, save in two cases, one of which was followed by acute and then chronic albuminuria, and the other by partial deafness. The minister who accompanied Mr. and Mrs. S. home from Chicago found on his return that one or two cases occurred in his own family (it being at his house the baby died), and also a boy or young man who watched with the corpse of the baby was attacked with the fever. Diligent inquiry afterward revealed the fact that Zoe S. (the first person to be attacked), was taken on the lap of Mr. S. (the father of the baby who died in Chicago, and whose remains were brought home for burial.) and caressed by him, and that he also was ill while in Chicago with symptoms resembling the baby's. And a few days afterward she came down with the disease, which was not even then suspected to be scarlet fever, or at least by people in this vicinity. Now had the disease been pronounced scarlet fever in Chicago, and called to the attention of the authorities there, much after suffering and anxiety would have been saved to the inhabitants of this village, whose loved ones lives were jeopardized in the manner in which I have related.

On Dec. 5, 1885, Dr. H. C. Maynard, health officer of the village of Hartford, Van Buren Co., writes as follows: "I have but one case of contagious disease to report this week, that of Miss N. F., age seven years. The source of contagium is peculiar. Miss G. H., of Grass Lake, Jackson Co., Mich., sick with scarlet fever, wrote a letter to the mother of this patient, and she, the little girl, had the envelope in her mouth. Seven days later she came down with the disease. It seems certain that she contracted the disease in that manner, as there is no other way that I can account for the appearance of the disease in that part of the township."

Dr. T. E. Woolsey, health officer of the township of Kearney, Antrim Co., in his special final report of May 8, 1885, states that the contagium was introduced into his jurisdiction "from an adjoining township into which this village [Bellaire] extends, where it seems to have been kept in a latent state for about one year, though it did not break out in a family that had it at that time."

Dr. D. D. F. Brown, health officer of the township of Eagle, Clinton Co., in his final report of an outbreak, Nov. 24, 1885, in his jurisdiction, amounting to 30 cases, states: "A family in an adjoining township had what was thought to be scarlet rash, and was allowed to visit in families or to mingle with the children, and from this cause was developed true scarlatina."

Dr. Fred Schermerhorn, health officer of the township of Dorr, Allegan Co., in his final report of an outbreak in his jurisdiction on June 5, 1886, says: "Children of a relative living twelve miles distant had scarlet fever in February last; after recovery and thorough disinfection of clothing, as they claimed, the family visited Mr. Hartzig's [where the disease first appeared] about the latter part of April, remaining two days."

Dr. W. B. Hathaway, health officer of Bloomingdale township, Van Buren county, regarding source of contagium, in an outbreak in his jurisdiction on March 1, 1886, writes substantially as follows: "Two children on the east side of the village of Gobleville, which part is beyond my jurisdiction, were attacked by this disease the last of February. They were attended by a person who told them they had no scarlet fever, but had only a sore throat and the scarlet rash, and that they would not communicate the disease. As a result all the children in the village were exposed."

Dr. S. B. Rollison, health officer of Marcellus village and township, Cass Co., reports relative to an outbreak on May 16, 1885, as follows: "Three or four children in the vicinity had recently had sore throat, accompanied by slight rash on chest and body, the first having occurred soon after the child's return from Chicago. No physician saw the cases, but they are supposed to have been mild cases of the disease from which this was contracted."

Dr. O. P. Horn, health officer of the city of Niles, in his final report of an outbreak on March 16, 1885, says: "A family by the name of Beale visiting our city have relatives living in the country who were afflicted with scarlet fever during the early part of the winter. They visited there, after all danger was supposed to be over; but there is where the present case must have originated."

Dr. Norman J. Cranmer, health officer of Columbia township and village of Breedsville, Van Buren county, in his report of the outbreak of June 2, 1885, says: "The above case was, in my judgment, imported from Kankakee, Ill., as the patient had recently come from there, and no cases had occurred in this vicinity recently." The doctor supplements this evidence with a letter from Geo. D. Carnes, the physician who treated the case, stating that the patient came from Kankakee, where there were cases of scarlatina. Relative to the next outbreak in this locality, which occurred on July 10, 1885, Dr. Cranmer states in substance that a little girl from the South came to Breedsville in the stage of desquamation and without his knowledge at the time. In about two weeks from that time a little girl belonging to the family where she came was reported sick with rash and sore throat.

Dr. G. W. Stone, health officer of the village of Metamora, in his report of Aug. 15, 1885, states as follows: "A young lady thirteen years of age came from a family living in Detroit where they had had scarlet fever. She came to Metamora to get rid of having the disease. Next morning after her arrival she visited a neighbor's family of six children." He further states that eight days later one of the family came down with scarlet fever.

J. W. Goodfellow, health officer of the township of Venice, Shiawassee county, says: "We believe that the first introduction of scarlet fever in our jurisdiction came by exposure in the city of Owosso."

Dr. W. G. Elliott, health officer of the city of Pontiac, relative to the outbreak of May 13, 1885, in that city writes: "A number of the family visited a family in an adjoining town where scarlet fever had just made its appearance, its diagnosis so recent that isolation was not enforced."

In regard to an outbreak on April 15, in the village of Lowell, Dr. A. M. Elsworth, health officer, writes: "I was not positive in regard to the first case; but some facts went to show that it was brought here from a distance by a convalescent scarlet fever patient not having been thoroughly disinfected."

In his report of an outbreak April 11, 1885, in Southfield township, Oakland county, Dr. S. Holcomb, health officer, writes: "A man living in Detroit who has a child living in this neighborhood came to see her, and in a short time the little girl was sick of scarlet fever. It was ascertained that he had been living with a family who were afflicted with the same."

Dr. James Totten, health officer of the township of Pierson, Montcalm county, in his report of an outbreak on May 8, 1885, states as follows: "Nearly all the children taken with the disease were going to school in the village of Pierson where the disease had just commenced to rage." In regard to an outbreak on Oct. 21 in the village of Pierson, of which Dr. Totten is also health officer, he states: "The boy, Robert Gaylord, was brought by his mother from Tecumseh, Oct. 21 of this year, and was the only case in the present outbreak."

Dr. H. H. Schaberg, health officer of Kalamazoo township, on April 22, 1885, writes: "The family in which the outbreak has occurred in this township has held free intercourse with the family sick in Comstock."

Dr. D. E. Robinson, health officer of the city of Manistee, in his report of an outbreak on May 7, 1885, states: "The disease was brought to this family in the clothes of a girl who came from the country to serve in the family."

Dr. D. L. Parker, health officer of Marine City, states: "As near as can be found the first member attacked had been exposed a short time before in Detroit."

The following are brief statements made by the various health officers concerning the source of contagium, of the outbreaks in their jurisdictions: "Exposure while visiting," "Direct communication," "Developed at school," "Brought from Alpena," "Exposure," "Brought from Chicago," "Brought from Ohio," "Taken at school," "Contracted at a Dutch dance," "Supposed from an infected house," "From the Sanitarium at Battle Creek," "Brought in from an adjoining neighborhood," "Brought from Jackson," "Brought from Grand Rapids," "Brought from a distance," "Brought from Calumet," "Brought from Louisville, Ky.," "Brought in by visitors," "Brought from Saginaw," "Brought by visitors," "Brought from Chicago," "Brought from Ohio," "Brought from abroad," "By infected clothing," "Contagion by contact," "Brought from Monroe and Jackson," "Brought by a visitor," "Brought from Lapeer," "Took disease on cars," "From Howard City," "Infected clothing," "Probably brought by a sailor," "From a young lady visitor," "At school," "From Saginaw," "Unknown; supposed from St. Charles," "Canada and Michigan City," "Direct contact," "At school," "From Genesee county," "From Bay City," "Direct contact," "Brought from Waltz, Mich.," "Infected clothing," "From Cadillac."

MEASURES TAKEN TO RESTRICT SCARLET FEVER—RESULTS.

Of the entire fifty-seven special final reports received from health officers for the year 1885, there is but one which does not state that measures were taken for the restriction of the disease, and forty-eight state that the restrictive measures were successful. Of the three hundred and fifty-six outbreaks reported, one hundred and seven were restricted to a single case each. Many were restricted to a single family, to two or three cases, or to those who were exposed prior to the establishment of restrictive regulations.

Not many of the fifty-six health officers who state that restrictive measures were taken designated exactly what they were. Such expressions as "quarantine and disinfection"; "house placarded, patient isolated and thorough disinfection"; "isolation and common methods of disinfection" occur frequently. If the kinds of disinfectants used and the methods of applying them had been stated in each case, an important and interesting comparison of results might be made. Ten health officers stated that they employed the fumes of burning sulphur as a disinfectant, and twenty-one stated that they disinfected as "prescribed by law," or that they followed the "instructions of the State Board of Health," and such expressions as lead to the conclusion that they used the fumes of burning sulphur in a closed room. Each of these thirty-one health officers report good results from their efforts at restriction. Some of the results are indicated as follows:

Dr. A. E. Bacon, health officer of the village of Sault Ste. Marie, in his report of an outbreak on June 6, 1885, in his jurisdiction, states that he employed the following method of restriction: "Isolation of the sick, and the use of chloride of lime, carbolic acid, and fumigating the room with sulphur after recovery." He further states that the outbreak was restricted to one case, though there were "several children in the family."

Dr. James Totten, health officer of the village and township of Pierson, Montcalm county, in his report of an outbreak Oct. 22, 1885, states that he took the following restrictive measures: "Complete isolation of the patient, allowing no one but the nurse and myself to see the case, placing notice on the house, and a thorough disinfection of the entire house after recovery. By coöperation of the family I have been able to restrict the disease to this one case."

Dr. S. B. Rolison, health officer of Marcellus, village and township, in his report of an outbreak on May 16, 1885, gives the method of restriction pursued by him as follows: "The school was closed, the family immediately quarantined, the patient kept as much as possible from the other members of the family which consisted of mother and two children, one eleven, the other seventeen years of age. All discharges were passed into a vessel containing a solution of sulphate of iron. The patient was bathed twice daily with permanganate of potash solution. Plenty of fresh air circulated in the room." There was only one case in this outbreak.

Dr. W. B. Hathaway, health officer of Bloomingdale, village and township, VanBuren county, in his report of an outbreak Aug. 27, 1885, states that he pursued the following method of restriction: "Isolation, quarantine and disinfection of patient and premises. The disinfectants used were sulphate of iron, permanganate of potash and solution of chloride of zinc as recommended by the State Board of Health." This outbreak was restricted to one case.

Dr. F. E. Wolsey, health officer of the township of Kearney, Antrim county, states that he took the following precautions: "Isolation and disinfection with sulphur and solution of sulphate of copper." The outbreak was restricted to one family.

Dr. W. G. Elliott, health officer of Pontiac, in reporting the outbreak of May 13, 1885, in that city, states that the following precautionary measures were taken: "Isolation of all members of the family susceptible, burning of all material of little value that was in contact with the patient, disinfecting all other articles by the zinc and salt solution [sulphate of zinc ?], and finally burning sulphur, whitewashing and thoroughly cleaning the rooms occupied by the patient." This outbreak was confined to one case.

Dr. David Hammell, health officer of New Baltimore, reports an outbreak stating that the following precautions were taken: "Placed notice on the gate-post, prevented ingress of neighbors, and temporarily restricted parents from going to stores, etc. Besides disinfecting the house according to your pamphlets, I used bromine, evaporating it in all the rooms well. The scarlatina and diphtheria 'smell' can thus be wonderfully sweetened. I even let the patient inhale a little of the fumes diluted with air to suit." He further states that there were but three other cases, and two of these, although young children, had the disease very slightly.

Dr. H. W. Jones, health officer of Houghton, in his report of the outbreak of November 20, 1885, in his jurisdiction, states that the following measures of restriction were taken: "The strictest quarantine of all the premises and persons living thereon, no one being allowed to leave the house under any pretense. Thorough disinfection of rooms, etc." There was but this one case in the outbreak.

Dr. S. S. C. Phippen, health officer of Owosso, in his report of an outbreak which occurred on May 27, 1885, states: "We placarded all the houses and isolated the patients wherever it was possible to do so, and also caused all the houses in which the disease existed to be thoroughly disinfected by burning sulphur or the sulphur pastilles of Parke, Davis & Co., and also caused all soiled clothing, etc., to be disinfected by zinc sulphate solution, etc. The children who had the disease and those living in the same house were kept away from school till thorough disinfection had been employed." The following resolutions of the Owosso board of health, adopted by the city council, evince something of the effort made in that city to restrict the disease:—

To Principals of Public Schools and Proprietors of Private Schools:

In pursuance of and addition to an ordinance of the city of Owosso, entitled, "an ordinance concerning the duties of the Board of Health of the city of Owosso," providing for the maintenance of the public health, now in force, it is hereby requested by the Board of Health of the city of Owosso, that the council of said city adopt the following:

1. *Resolved*, That whenever the Principal of any public school or the responsible head of any private school in the city of Owosso receives from the health officer of said city a notification that contagious, infectious, or pestilential disease exists in any household of said city, such principal of public school, or responsible head of private school, shall reject from his school all pupils from such household, until he receives further notice from the same source, that such disease no longer exist, in said household, and that the premises have been properly disinfected and renovated.

2. The principals of all public schools shall reject from the schools under their charge, all pupils who have not been properly vaccinated, or have not had the small-pox or varioloid, during an epidemic of said disease.

Neglect or refusal to comply with these regulations will be followed by prompt prosecution, the penalty for which shall be $100, (one hundred dollars) fine, or imprisonment, or both.

Adopted by the Common Council, Owosso, Aug. 17, 1885.

BOARD OF HEALTH, Owosso, Mich.

TRANSGRESSIONS OF HEALTH REGULATIONS—RESULTS.

While on the whole we have great reason for congratulation over the success of health authorities in restricting scarlet fever, it must still be regretted that in certain cases the health regulations were broken. It is of very great importance that every outbreak be at once reported to the local board of health, and that prompt and efficient precautionary measures be taken by that authority. When patients are promptly isolated and persistent isolation is maintained against all except the physician and nurse until recovery or death of the patient, and thorough disinfection of the premises, and when all precautionary measures are strictly carried out, then only may the best results be hoped for.

On Aug. 17, 1885, Dr. M. E. Bishop, health officer of the village of South Haven, writes: "No restriction has been laid on scarlet fever, and but few cases have been reported to me. Our local board would not uphold me in taking any measures to prevent the disease from spreading, and the people refused to have their houses placarded, or tore down the signs." This welcome to scarlet fever bore its legitimate fruit; for already in this locality alone 26 cases are traced to this as their origin, and it is impossible to state how much contagium by this unrestrained condition was carried into other localities to imperil other communities. In this outbreak the houses were not disinfected, and five months later the carpets of one of them were taken up, and two little girls who played on them were stricken with scarlet fever a little over a week later.

Dr. W. B. Hathaway, health officer of Bloomingdale, writes of an outbreak in his jurisdiction as follows: "I am credibly informed that two cases have occurred on the Pine Grove side of the village, and were treated by a person who did not report them to Dr. Huff, the health officer of that township." He further states that the person told the people that it was not scarlet fever, and that it was not communicable.

On March 16, 1885, Dr. A. R. Smart, health officer of Hudson, wrote: "What is to be done with a family when scarlatina is present, who refuse to stay at home but roam about the streets as they like? The law says fine them. That would do no good; they have nothing to pay. We have no local legislation covering the case. What is the course in such cases proper to pursue?"

In reply to the above, the following letter was sent from this office:

A. R. Smart, M. D., Health Officer, Hudson, Mich.

DEAR SIR:—Your letter of March 16 has been received. By this mail I send you a copy of the Public Health Laws of Michigan and have marked therein all the sections which seem to me to bear on the question. Section 56, page 16, of the compilation would seem to give the local board of health authority to cause the arrest of such person. I think your board could do what you want under sections 54, 56, and 58 of the compilation.

Very Respectfully,

HENRY B. BAKER, *Secretary*.

James W. Goodfellow, health officer of Venice township, Shiawassee county, in reporting the outbreak of October 3, 1885, states: "In this outbreak we found it impossible to do otherwise than to adopt measures according to law. In fact in the family of the first case the friends were determined to go and come, until we satisfied them that we could shut up their friends, and then we got control."

One health officer reports a lady who was allowed to leave her place of sickness while yet in the stage of desquamation, and this caused an outbreak in his jurisdiction.

Another health officer writes of a family who, returning from Dakota to their home in Michigan, stopped a few days in Chicago, and while there one child was taken sick and died of scarlet fever. The attending physician, it seems, neither reported it to the Chicago board of health, nor did he inform the family that the disease was scarlet fever, or that it was communicable. Thus, unaware of danger, the family brought the body with them to their home for burial, and from this resulted a serious outbreak there.

PERIOD OF INCUBATION OF SCARLET FEVER.

There are many difficulties in the way of determining the exact period of incubation of scarlet fever. Often the date of exposure is uncertain, and the poison may be carried in the clothing or hair for some time before being introduced into the system. Also, in this disease, the "primary fever" is sometimes so slight as to escape notice.

Of the fifty-seven health officers who made special final reports, only twenty-seven gave definite answers to the question concerning the period of incubation. These gave periods ranging from two days to three weeks. Three report the period two weeks; three state five days; two, eight or nine days; one estimates the period at from "two or three days to a week or ten days;" one, three weeks; one, seven to eight days; one, twelve or fourteen days; two, three to twelve days; one, seven to ten days; one, seven to fourteen days; one, eight to twelve days; one eight to fourteen days; one, four days to two weeks; one, eight, ten, twelve and fourteen days; one gives seven, eight, and ten days; one, four, seven, and nine days; one states nine, thirteen, and fifteen days; one, "about four days;" one, seven days, and one states eight days.

DISEASE SIMULATING SCARLET FEVER.

There were reported some outbreaks of disease resembling scarlet fever in most respects, but differing sufficiently to lead the attending physicians to doubt its being that disease. It seems to be contagious. This added to the fact that similarly reported outbreaks have ultimately developed typical scarlet fever in its most malignant form leads me to believe that the same measures of restriction, both in nature and thoroughness, should be enforced.

The following letter from Dr. C. M. Bradt, health officer of St. Charles, explains one of these peculiar outbreaks:

ST. CHARLES, MICH., July 18, 1885.

H. B. Baker, M. D., Secretary State Board of Health:

DEAR SIR:—A disease mild in form, but in many respects resembling scarlatina, has been somewhat general in this locality. The primary symptoms are those of the above stated disease, but the eruption differs very materially. After the vomiting, sore throat usually makes its appearance, accompanied by high fever of short duration. A rash follows, the surface of the body sometimes entirely covered, and that suddenly, with an urticaria. The eruption is in all cases discrete; it will come and go, each time apparently fading slightly until convalescence. The disease seldom lasts longer than from three to five days. It appears to be contagious. I consider it a malarial urticaria, and evidently usurping ague and bilious fever. I have taken precautions as far as practicable to prevent spreading; but it breaks out in many cases without apparent exposure. It is mild in cases where the age is under seven or eight years, and more severe in older patients. In adults it has been accompanied by a premonitory chill; in children it appears usually that vomiting is the first symptom. * * * After convalescence skin peels in scales; oiling surface, etc., I find of benefit. In short, I treat it as scarlatina, but do not believe it to be that disease.

Yours cordially
C. M. BRADT,
Health Officer of the Township and Village of St. Charles.

In reply to a letter from this office making inquiry regarding a reported outbreak of scarlet fever, in the village of Ithaca, a physician of that place after alluding to quite a number of cases, four of whom were adults, states: "A case which I was called to see to-day was contracted by sleeping in the bed occupied by one of the adult cases, showing to any one that it is contagious. And, notwithstanding the law, no reports are required, and not even a card or any other sign is placed upon the house to warn the public. Furthermore, the adults have been seen stalking through the streets daily while the rash was still covering the face. I offer this as an example of the action of our board of health in all similar cases." On receipt of this letter it was found that, as yet, the name of no person as health officer for the village of Ithaca had been returned to this office, and a vigorous letter was sent to the president of the village calling his attention to the statements and facts as above given. The president of the village replied as follows: "For some reason the appointment of health officer has been neglected, but the matter will have attention at the next meeting of the council." He further stated that he had consulted with some of the physicians, and from what he could learn, he could safely say there had not been a case of scarlet fever in the village for over a year; but he adds: "There has been a very mild rash, not contagious [?], prevailing to a small extent, principally among children."

One health officer reports an outbreak of "scarlet rash" which some physicians call "scarlatina;" but which he is inclined to regard as "catarrhal."

Dr. M. A. Tibbits, health officer of the village of Linden, Genesee county, in his report of an outbreak in his jurisdiction, states: "There is a dispute among physicians as to whether it was scarlet fever. The three sick were all in same family. There were five children under ten years of age and numerous adults exposed who did not take it. It was not termed or reported scarlet fever until eight days after the first case was taken sick."

SMALL-POX.

Small-pox is known to have existed from remote antiquity, and to have made fearful havoc among remote communities. There is no doubt that it existed in Hindostan, and probably in China before the time of Hippocrates. In the sixth century it was carried to Europe by the Mohammedans from Egypt and Arabia.[*] It was carried from the Netherlands to Germany in the same year that Columbus discovered America,[†] and in less than half a century it came to this continent, and helped to complete the cruelties of the conquest of Mexico. Mr. Prescott in his "Conquest of Mexico" speaks of the epidemic as "sweeping over the land like a fire over the prairies, smiting down prince and peasant, and leaving its path strewn with the dead bodies of the natives, who," in the language of a contemporary, "perished in heaps like cattle stricken with the murrain."[‡] Mr. Catlin in his "Lectures and Notes on the Manners, Customs and Condition of the North American Indians," writes: "Thirty millions of white men are now scuffling for the goods and luxuries of life over the bones and ashes of twelve millions of red men, six millions of whom have fallen victims to the small-pox, and the remainder to the sword, the bayonet or whisky." He also adds that it is his opinion from books and other evidence in his hands that of the "numerous tribes that have already disappeared and of those that have been traded with, quite to the Rocky mountains," each has had this disease, and in a few months lost one-half or more of its members.[§] This disease has also made havoc in Kamschatka, Greenland and Iceland,[‖] and in 1707 it destroyed one-quarter of the entire population of Ireland. Macaulay says of its spread in England before the discovery of vaccination:

> That disease, over which science has since achieved a succession of glorious and beneficent victories, was then the most terrible of all the ministers of death. The havoc of the plague had been far more rapid; but the plague had visited our shores only once or twice within living memory; small-pox was always present filling the church-yards with corpses, tormenting with constant fear all whom it had not yet stricken, leaving on those whose lives it spared the hideous traces of its power, turning the babe into a changeling at which the mother shuddered, and making the eyes and cheeks of the betrothed maiden objects of horror to her lover. During the century previous to the discovery of vaccination, small-pox is calculated to have destroyed 45,000,000 of the people of Europe.[¶]

This "most terrible of all the ministers of death," as Macaulay calls it, is no respector of persons. In England it disfigured William III. for life and killed his wife Mary; in Austria it conquered Joseph the First, and in

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[*] Ziemssen's Cyclopedia, vol. 2, p. 320; also "Vaccination—a report read before American Social Science Association," Oct. 27, 1869, p. 2.

[†] Medical News, May 15, 1886. p. 537.

[‡] The Truth About Vaccination, etc., by Ernest Hart, p. 3-4.

[§] The Truth About Vaccination, etc., by Ernest Hart, p. 5.

[‖] Ibid, p. 4.

[¶] The Health Service of a State, by Geo. E. Ranney, M.D., p. 170.

France the mighty Louis XIV; Peter the Second, Emperor of Russia, and Eleonora, Queen of Sweden.*

A new epoch in the history of small-pox was ushered in by the investigations and discoveries of Edward Jenner, which have been compared with the Declaration of Independence as rendering memorable the year 1776. The first to investigate in a scientific and practical manner this popular belief that "one who had had cow-pox could not take small-pox," Jenner performed the first vaccination ever performed with cow-pox virus. After the introduction of vaccination into Sweden the annual death-rate from small-pox fell from 1,973 to 479 per million, and after vaccination was made compulsory this average number was further reduced to 180 per million. In the German army during the Franco-Prussian war, all soldiers entering the army had to be re-vaccinated, and there were only 263 deaths from small-pox; in the French army this was not required, and there were 23,368 fatal cases of this disease.

Small-pox has existed in Michigan since the earliest settlements of the territory. From the first year in which vital statistics were collected in this State and reported to the Secretary of State (1867–68) to the year 1884, inclusive, there were reported to the office of the Secretary of State 962 deaths from small-pox. The greatest number of deaths in any one year (302) were reported in 1872. In this year the per cent of deaths from small-pox to deaths from all causes was 2.26. The per cent of deaths from small-pox to death from all causes in the year 1884 was .017, or the least of that reported in any year during the period. In this year three deaths occurred. Since the organization of the State Board of Health, small-pox has not been allowed to spread to an alarming extent. To be sure 159 deaths were reported during the year 1882, but they were the result of over 100 outbreaks in about 63 localities (owing to very large immigration from ports infected with small-pox). In sixteen of these localities small-pox was confined to the first case.

SMALL-POX IN MICHIGAN DURING THE YEAR ENDING DECEMBER 31, 1885.

There were reported in Michigan during the year ending Dec. 31, 1885, 9 outbreaks of small-pox and varioloid in the same number of localities. In these outbreaks there were reported 27 cases of small-pox including 6 deaths. There were also reported 7 cases of varioloid. During the previous year, small-pox was reported in 5 localities—22 cases, 3 deaths. The report of the outbreaks during the year 1884 may be found on pages 277–283 of the report for that year.

The following table shows the localities where small pox and varioloid were reported, the number of cases and deaths in each outbreak, and the dates when the first and last cases occurred.

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* The Truth About Vaccination, by Ernest Hart, p. 7; also Prevention and Control of Small-Pox, by Eugene Foster, p. 3.

TABLE.—*Stating localities where small-pox and varioloid were reported during the year 1885, the number of cases and deaths in each outbreak, and the day of the month when first and last cases occurred, as stated by the health officer.*

Localities.	Small-Pox.		Varioloid Cases.	First and last cases in 1885.
	Cases.	Deaths.	(No deaths.)	
South Boardman, Kalkaska Co	2	1	4	Jan. 12, Feb. 23
Alba, Antrim Co	1	1	1	April 24.
Battle Creek, Calhoun Co	5	2	....	Feb. 26, May 24.
Bellevue, Eaton Co	5	1	....	Mar. 6, April 13.
Cassopolis, Cass Co	1	....	....	March 17.
Grand Rapids, Kent Co	2	....	2	March 9, 21.
South Haven, Van Buren Co	9	1	....	Apr. 27, May 27.
Girard, Branch Co	1	....	....	June 4.
East Saginaw, Saginaw Co	1	....	....	Feb. 1[illegible]
Total in 9 localities	27	6	7	Jan. 12—June 4.

In the outbreaks during the year 1885 the per cent of deaths to cases of small-pox and varioloid was 17.6. In three outbreaks the disease was confined to the first case. The details concerning source of contagium, precautionary measures taken, etc., are given in connection with each outbreak.

OUTBREAKS AT SO. BOARDMAN (BOARDMAN TOWNSHIP), KALKASKA COUNTY, AND AT ALBA (STARR TOWNSHIP), ANTRIM COUNTY.

On page 282 of the Report of the State Board of Health for 1884 will be found a report of an outbreak of small-pox in South Boardman during the month of December, 1884. It was supposed that this outbreak was over at the close of the year. However, January 12, 1885, small-pox again broke out in South Boardman, and was reported to this office January 13 by the health officer, Dr. O. P. Askam. There were in this outbreak, in the year 1885, 4 cases of varioloid, 2 cases of small-pox, one of which was fatal, which added to the three cases (1 death) which occurred in November—December, 1884 (which are counted in the State Board of Health Report for that year), make 9 cases, including two deaths, in this entire outbreak in which the contagium was supposed to have been brought from Denver, Colorado.*

MEASURES TAKEN TO RESTRICT THE SPREAD OF SMALL-POX.

Concerning restrictive measures taken, Charles H. Brown, clerk of the board of health of the township of Boardman, writes: "The board has taken possession of a house for the isolation of the case and have closed up the road in front of the house, and made a road around in the field distant about 20 rods from the house."

In reply to a communication from the clerk of the board of health, stating that the board of supervisors had disallowed all small-pox bills, and that there was much opposition to restrictive measures taken, a letter went from this office urging the local board not to be discouraged by any opposition on the part of such citizens as were not informed as to the nature of and danger from small-pox, and stating that:—

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* Michigan State Board of Health Report. 1884, p. 281.

"The powers of your board are almost unlimited as regards measures for the restriction and prevention of this disease, and should be exercised without fear or favor in the interests of the public health. If your quarantine is strict and disinfection thorough, and the protective vaccination of the people general, this disease will not hold out very long. If, on the contrary, the measures taken to restrict the spread of the disease are only half-hearted, there is no telling how long the disease may last, how far it will spread, how many lives may be lost, or to how great an extent business interests may be paralyzed. If your board acts promptly and efficiently the good results of your action will soon be apparent and hostile criticisms will cease, and even the board of supervisors may be induced to reconsider their action."

A letter dated April 27, 1885, was received from James G. Vining, M. D., of Alba, Antrim county, stating as follows:—

"It has lately been reported that the small-pox at South Boardman has been entirely suppressed. Such cannot be the case, as the following statement will show.

"On April 7, 1885, a man came to this town from South Boardman; on Saturday, 24th inst., I was called to see him and diagnosed his case as small-pox of the hemorrhagic variety. On Sunday, 25th, Dr. Rockwell of Mancelona saw the patient with me and sustained my diagnosis. Last night he (the patient) admitted being at a house in South Boardman where they had had small-pox during the winter. This was three days previous to his coming here."

This patient died. There was also a case of varioloid in Alba taken from the first case.

April 28, 1885, a letter was sent from this office to the health officer of Boardman township, stating the facts in the case and urging that all houses in which small-pox had occurred should be properly disinfected. In reply a letter was received from S. J. Grandy, health officer, stating that the patient who went to Alba had stopped with a man in South Boardman who had acted as nurse in the hospital during the small-pox epidemic, that he had assisted this man in taking some bedding out of the hospital before it had been thoroughly cleansed. Another letter was received from the health officer stating that this man had "entered the pest house, gathered the feathers into a tick and sowed it up after the feathers had been spread out and exposed to the fumes of burning sulphur." This letter continues as follows: "I have had the bed and goods buried two feet under ground, where they remain; have burned all scraps of paper and rags in or about the pest house. I have had the wood-work and floors scoured and cleaned with concentrated lye, the walls and ceiling thoroughly whitewashed, and the yards cleaned."

A letter was received from Dr. Vining of Alba, stating that the people had been thoroughly vaccinated and that "the whole village is quarantined, and no trains stop. Every precaution is being taken to prevent an epidemic, and I trust our efforts will prove successful." The efforts were successful.

SMALL-POX AT BATTLE CREEK, BELLEVUE, AND CASSOPOLIS.

During the months Feb. 26–May 24, there occurred an outbreak of small-pox in the city of Battle Creek, consisting of five cases including one death. Concerning the source of contagium, Simeon S. French, M. D., health officer, writes in a letter dated April 12, 1885:

"The family (where the small-pox occurred) rented rooms to Grand Trunk men. A brakeman, I learned, was on a train on which there was small-pox—the date I do not know. He was rooming at this house and was some sick during the last days of February and the first of March. He had a very slight eruption which at first looked suspicious, but it almost immediately receded, not vesicating at any point. He had had small-pox, and declared that he was at the other end of the train and that there was no exposure."

Two daughters in this family in Battle Creek where the brakeman stayed and where the outbreak began, went to Bellevue where they were taken sick with small-pox. In this village there were five cases and one death as a result of this exposure. Concerning this source of contagium the reporter for this office in Bellevue writes as follows: "The general belief is that the brakeman on the C. and G. T. R. R. who was sick at this house in Battle Creek some four weeks ago had a mild form of small-pox, and communicated it to the rest of this family. At the time he was sick it was generally reported that he had the small-pox, but after his recovery the physician gave him a certificate denying it. It is certain that suspicions existed that it was that and nothing else, and the family scattered in hopes that part of them might shun it, at least appearances indicate that to have been their intentions. Two daughters came here."

There was also an outbreak of small-pox in Cassopolis, consisting of one case, March 17, 1885, where the patient was said to have been "exposed at Battle Creek by washing clothes."

Bearing upon the source of contagium of this outbreak in these three localities (Battle Creek, Bellevue and Cassopolis), Dr. A. Clifford Mercer, health officer of Syracuse, N. Y., in a letter to this office dated May 3, 1885, (enclosing a clipping from the Syracuse *Standard*, March 16, 1885, containing a letter from Dr. Mercer) stated that:

> Mr. and Mrs. A. of Rochelle, Ill., returned from Germany by steamer "India" which arrived in New York, Feb. 6, 1885. Feb. 7 or 8, they left on the Grand Trunk for Chicago where they arrived at 1 A. M., Feb. 12. They were snow bound two days at or near Battle Creek, Michigan. Mrs. A. began to be ill near Syracuse, and on her arrival in Chicago the health officer found her sick with small-pox in the Pullman sleeping car "Malmo." This car was fumigated and scrubbed, and again put on the road Feb. 18. Feb. 19 this car passed through Syracuse, and Mr. K. boarded her and served as flagman as far as Coyman's Junction. He again served as flagman on the Malmo on her return trip to Syracuse Feb. 22. March 4, Mr. K. was taken sick, and March 8 his case was diagnosed as small-pox. The India had a long passage, having left Hamburg Jan. 15, so that Mrs. A. doubtless contracted small-pox by exposure to infection on the India, and not in Germany before she sailed.

It was just 14 days after Mrs. A. arrived in Chicago on the Grand Trunk R. R. that the brakeman on the Chicago and Grand Trunk R. R. was taken sick in Battle Creek, and from this case the outbreaks in Battle Creek, Bellevue and Cassopolis are supposed to have originated. As will be seen in the article on the State Health Inspection Service (page 196 of this report) it is possible that the outbreak in Montreal, Canada, may have had the same source as the outbreak at Battle Creek, etc.

PERIOD OF INCUBATION OF SMALL-POX.

Dr. French reports concerning the period of incubation in the outbreak at Battle Creek as follows:—

"The eruption as above stated came out on the 26th of February. The next case made its appearance on the 16th of March, the chill and pains in back on the 14th or 15th. The next on the 18th, and the next, an infant, on the 20th."

At Bellevue:—

"The first case occurred March 6; case No. 2 was reported March 31; No. 3, April 1; No. 4, April 5; and No. 5, April 13; all being in quarantine in the same house."

MEASURES TAKEN TO RESTRICT THE SPREAD OF SMALL-POX.

Dr. French reports the following methods taken to restrict the spread of the disease in Battle Creek: "Perfect quarantine, isolation, disinfection, and vaccination. The patients were put in an upper room, and all moveable furniture, clothing, etc., was removed."

The following report was made concerning the measures taken to restrict the spread of the disease in Bellevue: "Strict quarantine measures were promptly resorted to, and the necessity of vaccination was urged upon the people generally. The last four cases were vaccinated with Fon du Lac points as soon as they could be had after the outbreak of the disease." The success attending the efforts at restriction was said to be "all that could have been expected under the circumstances,—the disease being confined to the house in which the first case occurred."

The two daughters in Bellevue, after recovery, were allowed to go "in the night with a team and old buggy" to their home in Battle Creek, "where the disease originated, and where the rest of the family are now sick of the disease, and they are quarantined the same that they would have been here" (Bellevue). "The girls were very anxious to go home and care for the rest of the family, and they were perfectly able to work,—in fact, had fairly recovered so far as sickness is concerned."

SMALL-POX AT GRAND RAPIDS, KENT COUNTY.

There was reported to this office, March 9, 1885, by H. N. Cargill, clerk of the board of health, Grand Rapids, an outbreak of small-pox consisting of one case, "a commercial traveler who thinks he was exposed on the train between Boston and here."

Two cases of varioloid and one other case of small-pox were reported as having been taken sick during the week ending March 21, 1885,—"all in same family and in same house." It is possible that this outbreak at Grand Rapids may be connected with the outbreaks at Battle Creek, Bellevue and Cassopolis, and the Pullman sleeping car "Malmo" mentioned above, though no such connection has been traced.

SMALL-POX AT SOUTH HAVEN, VAN BUREN COUNTY.

Small-Pox Mistaken for Chicken-pox.

There was an outbreak of small-pox in the village of South Haven during the months April 27—May 27, consisting of 9 cases and 1 death. The health officer, in reporting this case as a case of small-pox, wrote that:—"Not having much experience with the disease I diagnosed it as chicken-pox, to which opinion I still hold. Two other physicians call it modified small-pox. The majority rules and due precautions are being taken."

In reply a communication went from this office stating that:—"No harm can come from taking precautions in a doubtful case as though it were small-pox. The golden rule in such cases is to give the public safety the benefit of the doubt. Owing to an error in diagnosis small-pox gained a strong foothold in Ionia county two years ago. The health officer thought it chicken-pox, others thought it small-pox, and the result was that no precautionary measures were taken till many persons had been infected. It would be a good plan for your local board of health to offer free vaccination and to urge it upon all the citizens."

This outbreak proved to be small-pox,—the source of contagium being a German who "sailed from Bremen April 12 and landed in New York April 24. They said on the 'Donau.' * * * They arrived here April 27. First noticed the breaking out on the child's face on the 26th. The eruption must have appeared before that, as I saw the case on the 28th, and the vesicles were full and opaque, uncommonly small, and no apparent constitutional disturbance. Had heard of no cases of small-pox on shipboard."

PERIOD OF INCUBATION.

Dr. M. E. Bishop, health officer, reports as follows concerning the period of incubation in the outbreak at South Haven: "The period of incubation was from 10 to 18 days. One case escaping from having the disease by the first infection and being successfully vaccinated, escaped altogether. Six cases were varioloid; one confluent, scabs not falling off in over four weeks; two cases discrete, one very mild; the confluent case not badly disfigured."

MEASURES TAKEN TO RESTRICT THE SPREAD OF SMALL-POX.

Dr. Bishop reports as follows, May 23, 1885, concerning measures taken to restrict the spread of the disease: "I was ordered by a committee appointed by the board to prepare a place for the patients and have them removed. I refused to use violent measures or force, for the reason that in each house were people so sick that it was barely possible to remove them in the most gentle and careful manner. The next morning the removal was accomplished safely by clearing the streets of all passers. We have them all in hospital now and I am quite sure there will be no further spread of the disease. If the vaccine matter had been good, the German girl that came with the disease would have been our only case."

The disease in this outbreak spread to two families besides where the first case occurred.

May 16, a telegram was received from Geo. D. Carnes, M. D., of South Haven, inquiring as follows: "Can we as a school board close our schools against unvaccinated children?"

A reply was sent at once from this office by telegram, and also more at length by letter as follows:

"Your question is more properly a question for the Superintendent of Public Instruction than for this office. I am more accustomed to answer such questions as regards the powers and duties of local boards of *health*. Section 1,734 Compiled Laws of 1871, being Section 1,673 of Howell's Annotated Statutes, and Section 1,706 Compiled Laws, being Section 1,647 of Howell, seem to give the local board of *health* under certain circumstances power to do nearly everything which they judge for the best safety of the inhabitants. I know of no statute authorizing the school board to exclude unvaccinated children from school. Many years ago this board recommended such action by the local board of *health*. (See Rule 16, page xxi., Annual Report of the Michigan State Board of Health for the year 1875.) There may be a question whether the board of *health* can compel such action, unless during occurrence of dangerous disease. I know of no *statute* authorizing the *school* board to close the school on account of contagious diseases; but a decision of the Supreme Court (see page 53, paragraph 44 of the School Laws of Michigan, 1881) implies the right of the school board to do this, probably under the common law. It is possible, however, that that decision implies only that the school may be closed by the Board of Health?"

Dr. Carnes replied that the question had been referred to an attorney in South Haven, whose opinion was the same as that expressed above.

SMALL-POX IN EAST SAGINAW.

The outbreak of small-pox in East Saginaw consisted of one case—a man who had been working on the St. Clair flats. He was taken sick Feb. 17. Dr. Rouse, health officer of East Saginaw, reported that the patient sick with variola had been quarantined on a street with dwellings on one side only. He was placed in an upper room and no other cases were reported to have occurred.

OUTBREAK AT GIRARD, BRANCH COUNTY.

W. H. Perry, M. D., health officer of the township of Girard, in a letter dated June 11, 1885, writes as follows concerning the case of small-pox in that township, which was taken sick June 4, 1885:

"She had been for two weeks in the township of Bethel, about 18 miles from here, taking care of her mother who was sick, but had no attending physician. I saw her mother and she gave me the following facts. About the last of April or first of May she was taken sick with fever, severe pain in the head, etc., followed by a diffusive redness of the face with a number of eruptions, which she supposed was erysipelas, as she had been subject to attacks of that disease. She said that a few of the eruptions filled with pus, passed through the stage of dessication, etc. Pain in the head she said was the most prominent feature of the disease. I saw her on June 6th—about four weeks from the appearance of the disease—and found 7 or 8 characteristic pits, one in which dessication was not complete. There is but little doubt in my mind but that she was suffering from varioloid, which opinion coincides with that of Dr. G. S. Gillett of this place, who is the attending physician of the small-pox patient, and who has also seen the mother. About three weeks prior to the sickness of the mother she was at Bronson, a small village on the L. S. & M. S. R. R., but could think of no other way in which she could have contracted the disease."

Dr. John W. Martin, M. D., health officer of Bethel township, in reponse to a letter from this office, replied that he doubted very much that the above-mentioned case was a case of varioloid, because no other case had occurred in the family where she stayed or in the neighborhood, though perhaps over a hundred had been exposed. Perhaps the exposures which he mentions were before she had reached that stage of the disease when it can be communicated.

MEASURES TAKEN TO RESTRICT THE SPREAD OF SMALL-POX.

Dr. Perry reports the following measures taken to restrict the spread of the disease at Girard: "Complete isolation of patient on first discovering the disease, thorough vaccination of all who were exposed, thorough disinfection of all discharges, dishes and clothing before they were removed from the sick-room, which was in the second story of the house. Everything was removed by a temporary outside stairway. After recovery, all bedding, clothing, etc., was soaked in a strong solution of zinc sulphate, and every room in the house was fumigated with sulphur for 24 hours. Free vaccination was offered by the board. Every move was made promptly and efficiently. The family heartily coöperated with the board. The success attending the efforts at restriction was the very best as will be seen by no cases following the first."

SMALL-POX NOT FOUND WHERE REPORTED.

In the localities named below small-pox was reported to be present, the local health authorities were communicated with, and the report was subsequently found to be incorrect: Near Shelby, Oceana county, November, 1885; Pierson, Montcalm county, July, 1885 ("a case of pyæmia"); Detroit, Wayne county, November, 1885; New Era, Oceana county, November, 1885; and Brown's Camp, Iosco county, October, 1885.

REMOVAL OF BODIES DEAD FROM SMALL-POX.

On the receipt of a card dated October 1, 1885, from Dr. W. J. Law, health officer of Le Roy, the following letter was sent from this office to the editors of newspapers published in Grand Rapids, and to others:—

MICHIGAN STATE BOARD OF HEALTH, OFFICE OF THE SECRETARY,
Lansing, Michigan, October 2, 1885.

DEAR SIR:—It is reported to the State Board of Health that Sept. 30 H. N. Babcock started from LeRoy, Osceola Co., for Byron Centre, Kent Co., having in a wagon the body of a man dead one year from small-pox. He had no permit from the health authorities, and probably precautions were not taken; therefore there would seem to be danger of his spreading the disease, at least through his contracting the disease, unless he has been very recently vaccinated. Health officers along his probable route should be especially watchful for that disease, and the citizens generally will do well to be vaccinated. Health officers should arrest and isolate Babcock and whoever was engaged in disinterring the body, until such time as the danger of their having the disease is passed, say 16 or 20 days. All persons exposed should be promptly vaccinated.

Very respectfully,
HENRY B. BAKER, *Secretary.*

A telegram was sent to the health officer at Byron Centre requesting him to isolate Babcock, vaccinate those exposed, etc. October 6, however, information reached this office that the body had been carried "in the night to the cemetery just outside the village of Lisbon, in Sparta, Kent Co., and left in the street until morning and then buried."

Dr. Law, of LeRoy, also wrote further concerning the method of moving the body, as follows:

> "On the night of the 29th he tried to get up the body, but for some reason failed to get it up. On the morning of the 30th he tried to get three men to help him, all of whom refused. He then went to work and dug a trench at the end of the grave, took the end out of the outer box, hitched a horse to the coffin and drew it out in that way. They say that there must have been a very bad odor close to the grave, for Babcock had something over his face and that he left the grave frequently. They say they also smelt the stench. Mr. P. has given his affidavit to this effect. * * * Babcock did not burn sulphur in the grave. After he got the body out he threw in pieces of boards, etc., and filled the grave. He did not drive through the village with the body, but went around, and was seen with the new box which by the way he had brought with him and which was made air-tight by filling in cracks with white lead and by putting strips of rubber under lid."

January 31, 1885, a letter was received from Fred. C. Temple, attorney at law, Grand Rapids, asking whether or not it would be dangerous to the public health to exhume the body of a person who had died from small-pox the previous July, provided the box and casket containing said body were placed in a box lined with zinc so as to be water-tight. In reply a letter went from this office stating that it would be very dangerous to remove such a body, and especially in the winter, that no disinterment should take place except in warm weather and under the immediate supervision of the health officer. The letter continued as follows: "It should be positively known that the grave-digger is protected against the disease by recent successful vaccination, and he should be required to change his clothes after the exhumation and have them disinfected, and he should be kept entirely away from other persons for at least 12 days thereafter. Before the coffin is removed from the grave at least two pounds of sulphur should be burned in the grave covered by boards to insure thorough disinfection of the outside of the coffin and box at least."

WHEN MICHIGAN WAS FREE FROM SMALL-POX.

As will be seen from the table given on page 265, the State was free from small-pox during the months of July to December, inclusive, the period when small-pox was at its height in Montreal.*

PAMPHLETS DISTRIBUTED.

In addition to the pamphlets on the "Restriction and Prevention of Small-Pox," which are usually sent each year to health officers for distribution in localities where small-pox prevails, and also on the return of the name of a health officer to this office, there were distributed among the lumbermen, contractors, and foremen of lumber camps in Michigan during the epidemic at Montreal, 3,110 of these pamphlets, on the restriction and prevention of this disease. Many local boards of health at this time, on the recommendation of the State Board of Health, offered free vaccination, with the result that one propagator alone, Dr. E. L. Griffin, of Fond du Lac, Wisconsin, sent into the State during six months of the epidemic in Montreal (exclusive of those sent to the State Health Inspectors of Travel) nearly 17,000 bovine vaccine-virus points.

GLANDERS.

Glanders in horses is a disease which has been known and written about since the fourth century. The first written reference to the disease was made by a veterinary surgeon in the army of Constantine the Great. Van Helmont in 1682 thought this disease to be the origin of syphilis, which error Virchow ascribes to the general belief then prevalent that glanders and syphilis both appeared for the first time at the siege of Naples. The contagiousness of glanders was first recognized in 1664, though it was not established by accurately conducted experiments until a century later. Löffler and Shütz were the first to show that glanders in animals was accompanied by a special form of bacillus, which in size resembled closely the bacillus of tuberculosis. A few years ago Wassilief found these bacilli (with powers of 900 to 1,300 diams.) in the blood and pus from the pustules and nasal secretions of a glandered postillion. This disease has been found wherever horses have been found, in all localities and in all climates. Accompanied, where allowed to spread unchecked, by a high mortality, its dissemination in Europe has depended largely upon the sanitary measures adopted by local authorities. Says the author of the article in Ziemssen's cyclopædia: "In countries where there exist properly qualified medical boards, and efficient sanitary regulations capable of dealing with the infectious diseases of animals, the animal mortality from glanders is comparatively small." It has been communicated to man from grooming, feeding, or eating the meat of glandered horses. Glanders in man is almost incurable in its acute form and in about one half the cases in its chronic form. Though it occurs most frequently among those who by their occupation are most exposed to it, no one can be considered safe in a community where a glandered horse is permitted to live.

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* State Health Inspection Service, pages 196-217 of this Report.

GLANDERS IN MICHIGAN, YEAR ENDING DECEMBER 31, 1885.

During the year ending December 31, 1885, glanders was reported in Michigan in 5 localities, in one of which there was one death of a human being. The details are given in connection with each locality.

GLANDERS AT PINE GROVE TOWNSHIP, VAN BUREN COUNTY.

November 18, 1885, information reached this office of cases of glanders in the township of Pine Grove. A letter was at once sent to Dr. W. B. Anderson, health officer of that township, from which letter the following extracts are taken:—

"Glanders is an exceedingly dangerous disease communicable to man as well as to animals, and there is great danger that the disease will spread in your vicinity and be communicated to persons, if prompt action is not taken for its extermination. I trust your board will make a careful investigation, and if the disease is found among the horses of your township, that you will take prompt and vigorous measures for its extermination. For the local board of health not to act promptly in such cases would be little less than criminal negligence. By this mail I send you a paper on glanders, in the last part of which you will find full directions for the extermination of this dangerous disease. I shall be glad to hear whether you find the disease present in your jurisdiction, and also what measures you may take for its restriction and prevention."

In reply to the above communication the following letter was received from the health officer:

"Yours of the 19th received last evening, and contained the first intelligence I have had of the cases of suspected glanders in this vicinity.

"I have just returned this A. M. from visiting the premises in company with the township supervisor. We find five horses in an enclosure suffering from a disease said by those in charge to be distemper or nasal gleet. The horses were brought to this farm from Chicago for pasturage and care. [There was also one other case, in the same lot of horses, which was taken to another part of the township.] They have had some treatment for this disease ever since they were brought here, and those in charge say they are very much improved in health since they were brought here, which was about three months ago.

"The horses have been driven on or off the farm as required, and have been in the villages of Kendall and Gobleville. Two of these horses are quite sick, and discharge from the nose freely a purulent matter, sub-maxillary glands very much enlarged, one with hind leg considerably swollen.

"As I have never seen a case of glanders I am unable to positively diagnose them, but from their history and the literature I have on the subject I suspect them to be chronic glanders. I have therefore called a meeting of the township board to convene next Monday at 10 A. M., and shall lay the matter before them and urge the immediate employment of a competent and reliable veterinary surgeon, and obtain, if possible, a positive diagnosis, which I believe will be done at once. In the meantime I have ordered a strict quarantine of the cases, and shall report to you promptly all further action in the matter. * * * Will you please inform me what to do in case the township board employ a veterinary surgeon and the owners refuse to receive his diagnosis?"

In reply a letter was sent advising the board to secure the services of Prof. E. A. A. Grange, the State Veterinarian, and continuing as follows:

"The law under which Prof. Grange acts as State Veterinarian excludes *horses* from its provisions, and so his expenses and fee would have to be paid by your township. But your township can well afford that. After having the opinion of Prof. Grange that the disease is glanders, I should suppose that no resistance would be offered by reasonable people to the destruction of the animals; and that your board would be justified in destroying them even should the owner be so unreasonable as to object. If the horses have glanders, they are of course worse than useless, and the owner should be paid nothing for killing them. I would be glad to hear what is done."

In reply a letter was received stating that the local board of health had employed J. Sutton, V. S., of Kalamazoo, who pronounced the disease glanders, that the disease had most of the characteristic symptoms of that disease, but not all, that Dr. Sutton had recommended employing Dr. Grange, and that this was also the wish of the owner, who no doubt would willingly destroy the animals after another competent veterinarian had pronounced the disease glanders. After Prof. Grange had made the diagnosis and pronounced the disease glanders, the following letter was sent from this office to the health officer:

"I am informed by Dr. Grange, the State Veterinarian, that your board are still in doubt as to what course to pursue in regard to the horses having glanders in your jurisdiction; and that you desire more copies of my report on glanders in man and in domestic animals. By this mail I send you two copies. As two competent veterinarians have agreed in pronouncing the disease glanders I presume that there is no reasonable doubt in regard to it. Your board has enough information to justify its taking extreme measures in case the owner will not destroy the animals. It can act on the ground that the disease is a dangerous one to man as well as to animals. The local board of health can go to work under Sections 1690, 1700, 1701, 1703 and 1704 of the compiled laws of 1871 (being sections 1640, 1641, 1642, etc., of Howell's Annotated Statutes) to destroy the animals. I would advise your board to consult with your prosecuting attorney, providing you do not see your way clear after reading these sections. I would be glad to hear what is done by your board in regard to it."

A letter was received in reply stating that 5 of the glandered horses had been shot and buried.

GLANDERS IN NEWTON TOWNSHIP, MACKINAC COUNTY.

December 21, 1885, A. McEachern, health officer of Newton township, Mackinac county, reported one death from glanders of a male, aged 50, where the source of contagium was a "horse owned and worked by the deceased. * * * The animal being badly affected with glanders." The letter stated that the writer had been instructed by the board of health to communicate with this office in regard to the disease, and that there was "a number of horses in this isolated settlement supposed to be affected by the disease." The letter concluded as follows: "There being no veterinary surgeon anywhere within reach, we are powerless to act. The result will be that other horses and probably men will have the disease. Please advise with us at once what steps to take in this matter."

In reply a letter went from this office stating that if there were any doubt as to the disease being glanders, it would be better to employ a good veterinarian, such as Prof. Grange, the State Veterinarian, to visit the cases and decide. The letter urged that prompt measures be taken for the extermination of the disease, and was accompanied by a copy of a paper on glanders, also one on the work of health officers. No communication has since been received from this township.

GLANDERS AT GRAND RAPIDS.

A case of glanders was reported at Grand Rapids in July, 1885. In a letter to this office, dated July 30, H. N. Cargill, clerk of the board of health, enclosed a clipping from the Grand Rapids Democrat of the same date, explaining the ultimate action of the board. This clipping is as follows:—

> "The board of health have had information of a horse having the glanders for some time, but could not find the horse till yesterday at about three o'clock in the afternoon, when it was found hitched to a hitching post on Canal street. The appearance of the horse was such, indicated by the discharge from the nose and glandular swelling in the throat, that the board ordered the horse to be quarantined until investigation could be made by expert veterinarians.
>
> "Such examination has since been made and is pronounced to be a genuine case. The horse will be strictly quarantined till finally disposed of. It is a valuable trotting mare owned by Mr. Sligh Fisher. The disease is supposed to have been contracted from an animal that the board had ordered quarantined last spring, but that was quietly removed on the ground that the owner denied that it really had the disease. The said animal has since died, about two weeks ago, of the disease in its worst form."

GLANDERS AT ALPENA, ALPENA COUNTY.

September 10, 1885, information reached this office through a letter received at the executive office, that there were glandered horses at Alpena, and that these glandered horses were about to be taken into the township of Ossineke, Alpena county. A communication was at once sent to Mr. Ezekial Gerow, health officer of that township, urging the local board to make a careful investigation, and in case glanders was found among the horses in his jurisdiction that prompt and vigorous measures should be taken for its extermination. A letter was received in reply from the health officer of Ossineke township, stating that the horses had not as yet been brought into his jurisdiction, that he had notified the president of the board of health of Alpena City, and that they were then making an investigation. He also stated that the owner thought the state authority would "remunerate him for the horses before putting out of the way." In reply a letter was sent from this office stating as follows:—

> "I do not know how the owner of the horses can get payment for his glandered horses unless it be from the county of Alpena. There is no provision by which the State can pay for them; and as the horses having glanders are worthless, I presume that the county will not want to pay anything for them. It is a misfortune to the owner which he ought to bear just as he would loss by fire. If the horses are brought into your township, your local board should use its authority in destroying them, or in so isolating them as to prevent spread of the disease."

GLANDERS IN GARDEN, DELTA COUNTY.

June 22, 1885, the following letter was received from L. C. Beardsley, clerk of the board of health of Garden township:—

> "The township board of health of this township instructed me to write to you as to our duty in regard to glandered horses. There are several horses in this neighborhood afflicted with glanders. The owners refuse to kill them and we cannot find any law by which to act in such cases, but we believe they are a detriment to the public health. If we have the power to dispose of those horses without laying the township liable to pay for good horses, let us know how to proceed."

In reply to the above communication a letter was sent from this office, from which the following extract is taken:—

> "Your board of health could not be justified in ordering the destruction of the animals unless it is known that they actually have the glanders. When there is no doubt that the disease is glanders, the board of health should at once secure the destruction of the dangerous animals, by legal notice and order of the board, under sections 1699, 1700, 1701, 1703, and 1704 of the compiled laws of 1871."

If sections 1699, 1700, 1703, and 1704 of the compiled laws of 1871 (being §§ 1640, 1641, 1644, and 1645 of Howell's Annotated Statutes) or other statutes, do not give the local board of health ample authority to kill a glandered horse, or other glandered animal (as a nuisance), a law should be passed authorizing the board, on the certificate of an expert that an animal has the glanders, to order it killed. There should also be a law by which the local board may restrain from all places where he might communicate the disease, a horse or other animal suspected to be glandered, until his true condition can be determined. Concerning the power of a local board of health under the present laws in Michigan to destroy a glandered horse, Hon. LeRoy Parker, of Flint, formerly committee of this board on legislation in the interests of public health, states that "there is no question but what a board of health would be protected in destroying them [glandered horses] wherever found, after due notice to the owners, if in their opinion it was necessary for the public health. This protection, however, would only be afforded in case the disease was actually the glanders."

TYPHOID FEVER IN MICHIGAN DURING THE YEAR ENDING DEC. 31, 1885.

As yet the reports received concerning typhoid fever are not so complete and perfect as those received concerning scarlet fever, diphtheria, and small-pox. This is probably due in part to the short time that the office has been in communication with health officers concerning typhoid fever outbreaks (the work of communicating with health officers on an outbreak of this disease was begun about October 1, 1884), and some do not yet know that it is necessary to report such outbreaks. Again, the method of spreading this disease is so different from the usual method of spread of diphtheria and scarlet fever, that health officers have not been so successful in tracing the source of contagium, and consequently in very few cases have they been able to state definitely the period of incubation. Possibly cases and even deaths from typhoid fever have not been reported because they have been styled by attending physicians as "malarial" or "typho-malarial" fevers.

There were reported during the year ending Dec. 31, 1885, 218 outbreaks of typhoid fever in 200 localities, with 715 cases and 194 deaths. There are not counted in this connection outbreaks which were reported on the weekly report cards of reporters for the State Board of Health, and which were not otherwise reported, inasmuch as these reports do not usually state the number of cases and deaths, but only the "average order of prevalence." By means of these cards typhoid fever was reported in 32 localities, from which no other reports were received. Counting those reports only which stated the number of cases and deaths, there were reported during the year 1885, 254 less cases and 96 less deaths in 45 less localities than were reported in the same manner in the year 1884. This would seem to indicate that typhoid fever was much less prevalent in 1885 than in 1884, which conclusion is borne out by the weekly report cards of the correspondents of this board, which show that while the per cent of reports stating the presence of typhoid fever in 1884 was 12, and in the 8 years 1877–1884 was 13, in 1885 this per cent was only 8. The reports from Detroit in 1885 only stated the number of deaths from typhoid fever, no record being sent of the number of non-fatal cases. Subtracting from the above figures the 42 fatal cases where non-fatal cases were not reported, and the per cent of deaths to cases according to the reports was 23; in 1884 this per cent was 27.

TIME OF YEAR WHEN TYPHOID FEVER MOST PREVAILED.

Of the 180 outbreaks where the time of year was stated, the greatest number (26 in each month) began during the months of September and October. In each of the months of February, March, April and June there were 7 outbreaks respectively. During the five months July–November, inclusive, over three-fifths of all the outbreaks began.

SOURCE OF CONTAGIUM OF TYPHOID FEVER.

Forty-nine reporters stated that the source of contagium, or mode of introduction of typhoid fever into their jurisdiction was "unknown." Nine stated that the disease was sporadic or local. Other indefinite replies were received, such as "bad sanitation," "impaired vitality," "exposure in rain," "over-work and exposure," etc. One health officer writes: "There was nothing about the house that looked suspicious as regards contagium. The patient lived on a hill, the well being in good condition." Another health officer writes that the source of contagium was "from slops around the back door near the well, where all dish-water was thrown out and allowed to lay on clay soil." One health officer writes: "There has been no visiting or communication between members of the two families. Both patients had been in Adrian more or less before attacked. Home surroundings good."

In some outbreaks the source of contagium was reported to have been brought from other localities as follows: From Port Huron, Grand Rapids, Eaton Rapids, Kelley's Island, Indiana and Baraga. One health officer writes: "The patient came from Baraga into my jurisdiction with typhoid fever. At that time typhoid was prevalent in Baraga as an epidemic." Other reports were received as follows: "Stranger, sick when he came," "actual contagion by visiting sick," "exposure away from home," "communicated," etc. One health officer writes: "The first case was a lady who helped nurse her friends away from home, her girl taking it from her. Another was a young man staying with his cousin, who came from the north woods and was taken sick with it." Another health officer writing, Nov. 21, 1885, of two children sick with typhoid fever, said: "I learned that this boy and his sister had visited Grand Rapids, and stayed a week during 'fair time.' In my opinion the germs of the disease must have been received at Grand Rapids. It would be a very singular coincidence, otherwise, that only these two should be affected by a local cause." There were three other children in the family, but they were not affected.

In 23 outbreaks the source of contagium was said to be "impure water;" in four outbreaks it was stated to be "bad drainage." Other reports were received where the source of contagium was stated to be "low water in well;" "impure water from well, being largely surface-water;" "water infected by privy near well;" "impure water, privy within 12 feet of well;" "impure water, well near drains and privy vaults;" "privy near well;" "defective sewerage;" "supposed to have originated from an old tile drain, which was taken up by the first patient taken sick. This tile drained the barn-yard, and was said to be full of filth. * * * * It went through the whole family of seven children except one." "The first case of typhoid in my jurisdiction was in October or November. The source of which was not known, but all subsequent cases have originated in the same house." One health officer writes: "I think the source of contagium is bad water; the parties live on the edge of a swamp, their well is in low gronnd, and the surface water soaks into it from the low land." Another health officer writes: "The water used by this family (who reside over a store) is from an artesian well in cellar, depth 36 feet, the discharge being taken up in the surrounding soil. The point where the slops from the soil are emptied is 20 feet distant from the well. The cellar has been very damp since the well was put down. They kept potatoes, butter, and lard in the cellar."

Dr. H. H. Schaberg, Kalamazoo, in a letter concerning typhoid fever in his jurisdiction during the month of March, writes:—

> "The probable source of infection was gas arising from a cess-pit. The pit is some 40 feet from the house and is about 17 feet deep. Three pipes empty into it, one being connected with a cistern which is not used, and two being connected with bath-rooms, wash bowls, sinks and closets in the house. Both of these pipes are provided with traps, one just before its exit from the building, the other about midway between the building and cess-pit under the surface of the ground. There is no pipe to carry off gases generated in the pit. Last winter the top of the pit was boarded over, but at present it is open. The disused cistern is in a wing northwest of the house, and connected with the east of the house by a covered and inclosed passage. When the cistern was being cleaned a short time ago, it was noticed that water returned from the waste pipe into the cistern, which waste pipe empties, as stated above, in cess-pit. The doctor says he noticed offensive odor in bath rooms as if from escaping sewer gas, but using chloride of lime freely, and the two pipes being trapped, he thought no serious result would ensue before he could have it attended to this spring."

A wide-spread outbreak of typhoid fever existed in Ionia, beginning in July, 1885. It was estimated that there were as many as 40 cases in this outbreak, and at least 4 deaths. Concerning the source of contagium, Mr. Erwin F. Smith, formerly a citizen of Ionia, in a letter dated August 3, 1885, writes:—

> "I think the public water-supply which is drawn from wells in a thickly-settled part of the community, i.e., inside the corporation, has in some way been infected. To my knowledge Ionia has been comparatively free from typhoid for at least eight or ten years. The very foul condition of the back alleys on Main Street, due to garbage and overflowing privies, may also be a predisposing, if not an exciting, cause. The extremely foul condition of these alleys in the more crowded business part of the city has been a source of annoyance and of danger for years. The city has no system of sewerage or other method of disposal of night-soil. The subject is being discussed in a lively way in the Ionia city papers, and there is a general interest among the citizens."

Dr. Will Barnes, health officer of the city of Ionia, in a letter dated August 10, 1885, writes:—

> "I very much doubt if one-third of the above mentioned number (27 cases) were typhoid. I understand that the wildest rumors are afloat over the State concerning the sanitary condition of Ionia, but it all grew out of remarks made by a few cranky newspaper correspondents. During July it was very hot and dry, and the river was six inches below the water-mark. * * * Every possible precaution has been taken against the spread of the infection."

A letter was sent from this office asking the health officer just what precautionary measures were taken, whether or not the discharges were disinfected, and with just what disinfectants, how they were disposed of after disinfection, also the usual water-supply of those taken sick and the incidental water-supply 11 days to two weeks previous to being taken sick. No reply was received to this communication. It is to be regretted that the health officer did not supply the information asked for. From other reliable sources it is learned that the disease continued to prevail in Ionia until some time during the winter, and that there were between fifty and a hundred cases of sickness, the cause of which ought to have been traced.

The following interesting statements are extracts from a letter received March 24, 1885, from E. J. Ross, M. D., health officer of Rome township, giving facts concerning an outbreak of typhoid fever in that township during the autumn of 1877:—

> "The summer of 1877 was dry and hot after the 4th of July; so were September and October, water in wells quite low. The outbreak occurred at the hotel located at this place. The first case was taken down September 10, 1877; second, September 11; third, September 12; fourth, September 30; fifth, November 6. At that time the family consisted of landlord, wife, and two children, with four day boarders. The first, second, and fourth cases were boarders. The third was the landlord's oldest son. The fifth was the landlady. The boarder who escaped was absent very frequently, whole days at a time; besides he had the disease several years previously in New York, according to

> this statement. The first case was very severe; second, mild; third and fourth, severe; fifth, mild. No cases preceded them and none followed them in this township. * * * * There had been no case of enteric fever in the hotel since the fall of 1868,—a period of nine years. * * * * There would seem to be abundant indications here for local cause. Upon investigation it was found that, about the middle of summer, the proprietor of the hotel had caused an old well, long disused, to be cleaned out and the water contained therein to be used for cooking and household purposes. This old well (now filled up) stood in the northwest corner of the woodhouse, 10 feet from kitchen door. Sixty feet from well, on a line directly north, stood an old privy as old as the well. It never was cleaned out that anybody knows of. About the last of March, 1877, it was blown down in a severe wind-storm, and the landlady persuaded her husband to move it up next to the wood-house. It then stood about 10 feet from the old well, where it has ever since remained,—covering the old vault with a layer of dirt, —this before the heavy spring rains."

PERIOD OF INCUBATION OF TYPHOID FEVER.

Very few facts were reported concerning this important question. One health officer reported that "there was but one family where more than one case occurred, the second case coming down six days after the first one, but continuing for a shorter period." Another health officer reported: "The young man who staid with his cousin [the cousin came from the north woods and was sick with typhoid fever] began to complain of being tired on the seventh day, and was taken sick on the thirteenth day."

MEASURES TAKEN TO RESTRICT THE SPREAD OF TYPHOID FEVER.

Four health officers reported that the discharges from the patient had been disinfected. (Of course it would have added much to the value of their reports if they had stated what disinfectant and how much was used.) Ten others reported that disinfectants were used. Four reported that the discharges from the patient had been buried. One wrote that he had been "careful to destroy all discharges from the patient." One health officer reported that "all precautions necessary to prevent its spread are rigidly enforced." One health officer in a report dated Nov. 26, 1885, writes that the measures taken to restrict the spread of the disease had been "to use water from another well, and clean up and sand the place near open well, to immediately bury all discharges from bowels a good distance from house and well." No other cases occurred after these two which were taken sick the same day.

Dr. H. H. Schaberg, health officer of the township of Kalamazoo, in a letter dated April 18, 1885, reports as follows: "The measures which have been taken to restrict the spread of the disease are as follows: Isolation of patient, thorough use of disinfectants, and burial of the excreta. The success attending the efforts at restriction was that thus far there has been only one case, viz., the one first taken down."

Thomas Sullivan, health officer of Dwight township, writes of methods taken to restrict an outbreak of typhoid fever in his jurisdiction, consisting of five cases, as follows: "In this case the board of health was not informed of it till the last case was taken down—the rest had recovered. We posted notices and took precautions that the neighbors were not running in and out, cleaned and fumigated the rooms under the direction of the attending physician. The disease was confined to the family in which it started."

Where the discharges were disinfected, buried or destroyed, the outbreak was confined in four instances to the first case, and in two instances to the two cases where it first occurred.

TYPHOID FEVER AND KINDRED DISEASES.

Geo. D. McCollum, M. D., health officer of the township of North Star, writes concerning an outbreak reported as typhoid during the month of November, 1885:

"As I understand it they were not pure cases of typhoid fever, at least they told me the physician attending them said they were not, and, by what I can find out by questioning, I would say they were cases of continued billious remittent fever, but will report it to you as it was reported to me."

July 4, 1885, a case of typhus fever was reported at Grand Rapids. As this extremely dangerous contagious disease has not been epidemic in the United States for some time, and as it rarely reaches Michigan, a letter was at once sent to the clerk of the board of health, Grand Rapids (after an unsuccessful attempt to communicate by telephone), asking for further particulars in regard to the case, and stating that "if typhus fever is present in Grand Rapids, your board has important work on hand to stop its spread." In reply a letter was received from H. N. Cargill, clerk of the board of health, stating as follows:

"It is the opinion of physicians who have had knowledge of the case that it was a malignant form of typhoid. The patient was a Hollander, who has been in the city about 5 years, 20 years old, been married about 2 years, lived in the upper rooms of a small house. The house is situated on low ground, inclined to be boggy. The lot was the lowest one of a number of them, adjoining cow-barns, chicken coops, privy vaults, with well between the houses and barns. Foul water was the probable cause, as well as the general unhealthiness of surroundings."

A letter was also received from Dr. Arthur Hazlewood, member of the State Board of Health, stating that the patient had died of perforation of the bowels, that the attending physician was a German, and that as the Germans often spoke of typhoid fever as "abdominal typhus," this was perhaps what he meant.

MEASLES IN MICHIGAN DURING THE YEAR ENDING DECEMBER 31, 1885.

There were reported in Michigan for the year ending Dec. 31, 1885, by all the reports received at the office of the State Board of Health (excepting the weekly report cards, and including letters, and blanks "L," "K" and "M," sent during the outbreak or just at its close, and the annual reports of clerks and health officers received at the close of the year) 673 cases of measles in 70 localities, an average of about 10 cases to each locality. There were 23 deaths reported. The reports from Detroit did not state the number of non-fatal cases. Subtracting from the above figures the 5 deaths where non-fatal cases were not reported, this leaves one death to every 37 cases.

During the year 1884 there were reported to this office 2,173 cases of measles and 33 deaths in 131 localities, an average of 15 cases to each locality and only one death to every 66 cases. It will thus be seen that there were over three times as many cases and 10 more deaths in nearly twice as many localities in the year 1884 as in 1885. The weekly report cards of observers of diseases for the board show a similar decrease in 1885 compared with 1884, for while the per cent of reports stating the presence of measles during the eight years 1877–1884 was 14, and during 1884 was 10, in 1885 this per cent was only 5.

Probably both in 1884 and in 1885 the number of cases and deaths reported to this office and stated above is much too small. The average annual number of deaths for the ten years 1873–1882 reported to the office of the

Secretary of State was 132,* and there is reason to believe that even this is not more than one-half the number of deaths which actually occurred.

SOURCE OF CONTAGIUM OF MEASLES.

Sixteen reporters (health officers and clerks) stated that the source of contagium was "unknown." Ten reported that the disease had been introduced from some other locality. Four reported that the disease had been taken at school. Other reports stated that it was "epidemic," "sporadic," and "contagious."

TIME OF YEAR WHEN MEASLES WAS MOST PREVALENT.

Of the forty-eight outbreaks, where the time of the year was stated, 25 began during the months April to June inclusive.

MEASURES TAKEN TO RESTRICT THE SPREAD OF MEASLES.

In a few instances it was reported that the patients had been "isolated," that "notices had been posted," and that "care had been taken to keep children away."

WHOOPING-COUGH IN MICHIGAN DURING THE YEAR ENDING DECEMBER 31, 1885.

There were reported in Michigan during the year ending December 31, 1885, by all the reports received at the office of the State Board of Health, except the weekly report cards of correspondents, 2,686 cases of whooping-cough in 143 localities, an average of about 19 cases to each locality. There were 65 deaths reported. The reports from Detroit did not state the number of non-fatal cases. Subtracting from the above figures the 18 deaths where non-fatal cases were not reported, and the per cent. of deaths to cases according to the reports was 2.

Probably the number of cases and deaths stated above is greatly below the number which actually occurred. The annual average number of deaths reported to the office of the Secretary of State for the 14 years 1869–1882 was 150,† and there is reason to believe that even this number is not more than one-half the number which actually did occur. The mortality from whooping-cough is however so much less than that of diphtheria and scarlet fever, and the difficulties of restriction, etc., are such, that it has not engaged the attention of the office of this Board to the same extent. This will in part account for the incompleteness of the reports concerning this disease compared with diphtheria and scarlet fever.

SOURCE OF CONTAGIUM OF WHOOPING-COUGH.

Thirty-five reporters (health officers and clerks) reported that the source of contagium was "unknown," five stated that it was "at school" (one said "brought to school by a non-resident.") Twenty-three stated that the disease had been brought from some other locality (in one instance from Cincinnati, in another from Dakota). Eight replied to the question as to the source, that the disease was "epidemic." One health officer stated that the patient was "exposed on cars." Other replies were received as follows: "exposure," "spontaneous," "severe cold," "lack of ozone."

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*Sixteenth Registration Report, Michigan, p. 268.

†Sixteenth Registration Report, Michigan, for 1882, p. 269.

TIME OF YEAR WHEN WHOOPING-COUGH WAS MOST PREVALENT.

About the same number of outbreaks began during the spring, the summer, the fall, and the winter months. There seemed to be a very slight falling off in the spring. These results correspond with those obtained from the weekly report cards of observers of diseases for the Board for a series of years (1877–1883).*

MEASURES TAKEN TO RESTRICT THE SPREAD OF WHOOPING-COUGH.

In some instances notices were posted at places where the disease was nown to exist, and patients were isolated.

Many lives might be saved by the general observance of proper measures for the restriction of whooping cough.

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* Report of the Michigan State Board of Health, 1884, p. 204-5.

ALPHABETICAL INDEX.

PAGE.

Abbott, Dr. S. W., on sanitary status of Massachusetts 157-158
American Public Health Association endorses report on "Practical work required for the prevention of cholera in this country" 154
Anderson, Dr. W. B., on outbreak of glanders 273
Andrews, Dr. W. H., on outbreak of diphtheria 237
Appropriaton (annual) for State board of health of New York 161
    for board of health of Richmond, Va. 165
Arthur, President, interest of in public health 169
Asylum (Northern) for the Insane, examination of plans 177-180
    (Michigan) for the Insane at Kalamazoo, examination of plans 180
Atmospheric pressure in Michigan in 1884 and previous years, ... 14-15, 82-86, 120-122, 124-125, 127, 130-132, 134, 136-138, 141, 143-146, 148.
Auroras, meteors, halos, etc. 51, 52, 53
Average disease, sickness from 135, 146-147, 148
Avery, Dr. John, report on examination of State house of correction at Ionia ..... xxx, 175-176
    annual address of, as President of State Board of Health xxxi
    reëlection of as President of State Board of Health xxxii
    library books loaned to xxiii
    term as member of Board, address, committees, etc. ..... vii-viii

Baker, Dr. Henry B., on examinations of plans for public buildings 177-182
    on sanitary work in Michigan 158-159
    on testing illuminating oil in Michigan 171-173
    resolution on epidemic contingent fund 167
    on meteorological conditions in Michigan in 1884 1-86
    report on conferences of representatives of State Boards of Health 151-173
    on communicable diseases in Michigan in 1885 227-282
    report on "Practical work required for the prevention of cholera in this country" 152-154
    on good health results from sanitary work 191-195
    on State health inspection of travel 196-217
    on "Time of Greatest Prevalence of each Disease" 87-151
    library books loaned to xxiii
Baltimore, Dr. James A. Steuart on sanitary status of 157
Barnes, Dr. Will, on outbreak of typhoid fever in Ionia 278
Beardsley, L. C., on outbreak of glanders 275
Beebe, Arthur, meteorological observer, number of reports made 6
Begole, Gov. Josiah W., recommends contingent appropriation, to gaurd State against cholera, etc. 196-197
Bishop, Dr. M. E., on outbreak of scarlet fever 260
Board of health (local), prevention of introduction of communicable diseases 184-189
    names and addresses of health officers of ..... ix-x
    annual reports by clerks and health officers of xiii
    duty of, relative to glanders 273, 274, 275
    should make and give notice of regulations 189, 190, 249
    may grant permits for removal of sick persons, etc. 188
Boies, Lieut. A. H., number of meteorological reports made, etc. 6
Boston, Dr. S. H. Durgin on sanitary status of 156

PAGE.

Books and periodcals of the Board ... xi
  received by purchase and gift, fiscal year 1885 ... xiii-xxiii
  loaned from library at close of fiscal year 1885 ... xxiii-xxiv
Bronchitis, diagram, per cent of weekly reports of, by months in 1884 ... 95
  in 1884, and previous years, reports compiled by months ... 94, 97-113, 123
  relations of, to climatic conditions, by months in 1884 ... 122-123, 124, 145
  importance of, as a cause of sickness in Michigan, each year 1881-4 ... 117
  importance of, as a cause of sickness in several parts of Michigan, 1884 ... 88, 118-119
Bradt, Dr. C. M., on disease simulating scarlet fever ... 262
Brooks, Hon. Erastus, on sanitary status of New York ... 160
Brooklyn, Dr. J. H. Raymond's report on sanitary condition of ... 161
Bulletin, Health in Michigan, August, 1885 ... ix
Bulletins, monthly, Health in Michigan ... 150-151
Burials of persons dead from contagious diseases ... 160

Cabell, Dr. J. G., on sanitary condition of Richmond, Va. ... 165
  on death-rate among colored population ... 165
Calkins, Dr. H. T., on reason of less sickness in Petoskey ... 193
Cambridge, Dr. A. Holt on sanitary status of ... 158
Canada, Dr. C. W. Covernton on sanitary work in ... 166
  quarantine in ... 166
Canadian health work ... 153
Canniff, Dr. William, on sanitary work in Toronto ... 167
Cargill, H. N., on outbreak of glanders ... 274, 280
  on outbreak of diphtheria ... 238
Caulkins, Dr. J. S., number of meteorological reports made, etc. ... 6, 51
  weekly reports of sickness made by ... 115
Causation of diseases, meteorological statistics in studying ... 2-4, 5
Causes of diseases, contributions to the study of ... 87-151
  (meteorological) why so little is known ... 4-5
Cerebro-spinal meningitis, per cent of weekly reports of, by months in 1884 ... 143
  weekly reports of in 1884 compiled by months ... 94, 97-113
Chancellor, Dr. C. W., on sanitary status of Maryland ... 157
Charleston, Dr. H. B. Horlbeck on sanitary condition of ... 163
Cheese, poisonous ... 218-236
Cholera, Governor's message concerning ... 196-197
  official inspection at foreign ports ... 152-153
  Asiatic, in Tennessee ... 164
  in New Hampshire ... 160
  bill to prevent introduction of into Michigan ... 197
  practical work for the prevention of, in this country ... 152-154
  origin and dissemination of ... 152
  preparations by different states and cities to resist ... 155-167
  years in which it reached Indiana ... 156
  Dr. Raymond's proposed methods for preventing ... 161, 168
  years in which it visited Pennsylvania ... 162
Cholera infantum, diagram, per cent of weekly reports of, by months in 1884 ... 95
  in 1884 and previous years, reports compiled by months ... 94, 97-113, 139
  relations of, to climatic conditions, by months in 1884 ... 136, 137, 138, 146
  importance of, as a cause of sickness in several parts of Michigan, 1884 ... 118-119
Cholera morbus, diagram, per cent of weekly reports of, by months in 1884 ... 95
  weekly reports of, in 1884, compiled by months ... 94, 97-113
  importance of, as a cause of sickness in Michigan, each year 1881-4 ... 117
  importance of, as a cause of sickness in several parts of Michigan, 1884 ... 118-119
Cincinnati, Dr. C. W. Rowland on sanitary condition of ... 162
Cleveland, Dr. G. H., meteorological observer, number of roports made ... 6
Climate and sickness ... 5, 122
Climatology, medical and sanitary ... 2, 5
Cloudiness in Michigan in 1884 and previous years ... 8-15, 48-50, 51-53, 120-121, 124-125, 127, 130-132, 134, 136-138, 141, 143-146, 148.
Cobb, Lee S., number of meteorological reports made, etc ... 6
Communicable diseases, prevention of introduction of ... 183-190
  law for prevention of introduction of ... 184-187
  expenses by whom paid ... 186

PAGE.

- Communicable diseases, act 230, Laws of 1885, to prevent introduction of into Michigan...... 197
  - in Michigan in 1885 227
  - (*See diphtheria, scarlet fever, small-pox, typhoid fever, etc.*)
- Conferences of representatives of State boards of health...... 151-173
  - committees of...... 167, 169
  - constitution of...... 170
- Conger, Norman B., number of meteorological reports made, etc...... 6
- Connecticut, Dr. C. A. Lindsley on sanitary status of...... 155
- Contagious and infectious diseases. (*See "Diseases Dangerous to the Public Health."*)
- Consumption, pulmonary, diagram, per cent of weekly reports of, by months in 1884...... 135
  - in 1884 and previous years, reports compiled by months 92, 94, 97-113, 134
  - relations of, to climatic conditions, by months in 1884...... 125, 134, 145
  - importance of, as a cause of sickness in Michigan, each year 1881-4...... 117
  - importance of, as a cause of sickness in each of several parts of Michigan, 1884...... 88, 118-119
- Corcoran, Dr. John P., on outbreak of scarlet fever...... 255-256
- Covernton, Dr. C. W., on sanitary work in Canada...... 166
- Crain, Dr. E. A., on incubation in cases of diphtheria...... 251
- Cranmer, Dr. N. J., on outbreak of diphtheria...... 247
- Croup, diagram, per cent of weekly reports of, by months in 1884...... 129
  - in 1884 and previous years, reports compiled by months 94, 97-113
  - relations of, to climatic conditions, by months in 1884...... 125, 127, 145
  - croup and diphtheria, unity of...... 243
- Culver, Dr. S. H., on outbreak of diphtheria...... 244
- Cutting, Dr. Hiram A., ozone experiments and attack of pneumonia...... 3

- Dairy products, State law of 1885 declared unconstitutional...... 174
- Day, Dr. Henry, experiments with ozone, effects on warm-blooded animals...... 2-3
- Dayton, Dr. A. H. Iddings on sanitary status of...... 162
- Death-rate, high among colored population in Richmond, Va., attributed to poverty...... 165
  - in Charleston, S. C...... 163
  - in Boston in 1884...... 158
- Dead bodies (infected), necessary requirements for transportation...... 188
- Diagrams, meteorological conditions in Michigan in 1884...29, 34, 37, 41, 43, 48, 55, 64, 66, 70, 73, 74, 76, 85
  - relating to meteorological conditions, explanations of...... 81
- Diarrhea, diagram, per cent of weekly reports of, by months in 1884...... 95
  - in 1884 and previous years, reports compiled by months...... 92, 94, 97-113, 139
  - relations of, to climatic conditions, by months in 1884...... 136, 138, 146
  - importance of, as a cause of sickness in Michigan, each year 1881-4...... 117
  - importance of, as a cause of sickness in each of several parts of Michigan, 1884...... 118-119
- Diphtheria, history of...... 227-228
  - in Michigan in 1885...... 228-252
  - map showing distribution of in Michigan in 1885...... 230
  - age of diphtheritic sick and decedents...... 231
  - source of contagium...... 231-239
  - how long will contagium of remain active...... 239-240
  - mistaken for other diseases...... 240-243
  - measures taken to restrict...... 243-246
  - outbreak of in which health regulations were not respected...... 246-249
  - success of efforts for restriction of...... 249-250
  - period of incubation of...... 250-252
  - resolution of Board relative to doubtful cases of...... 243
  - removal of bodies dead from, after a period of years...... 250
  - dissemination of documents relative to...... 251-252
  - diagram, per cent of weekly reports of, by months in 1884...... 129
  - in 1884 and previous years, reports compiled by months...... 92, 94, 97-113, 128
  - relations of, to climatic conditions, by months in 1884...... 125, 130, 145
  - importance of, as a cause of sickness in several parts of Michigan in 1884...... 118-119
  - prevention of introduction of...... 183-190
  - annual average number of deaths from, in Michigan...... 183
  - sickness from, in Michigan in 1884...... 183
- Diseases, prevalence of several, in 1884...... 91
  - which cause most sickness...... 91
  - contributions to the study of the causes of...... 87-151
  - "cold weather," relations of to meteorological conditions...... 125-126

PAGE.
Diseases, "warm weather," relations of to meteorological conditions 137
  (*See Weekly Reports.*)
  dangerous to the public health 227-232
  (*See Diphtheria, Scarlet fever, Small-pox, Typhoid fever, etc.*)
  reported on cards in addition to those tabulated 149-150
Disease, greatest prevalence of each 87-151
Disinfection, neglect of, the cause of three deaths 249
  of clothing, baggage, rooms, etc....199, 202, 205, 208, 209, 210, 211, 212, 233, 243-246, 249, 258-260, 270, 279
  of infected baggage, etc., warrant for, etc 184-185
  for diphtheria 243-246
  for typhoid fever xii
Disinfectants, commercial, Dr. Blyth on 245
Dissemination of information by State Board of Health .... xi-xii
Drake, W. T., number of meteorological reports made, etc 6
Draper, Dr. Daniel, on importance of ozone observations 2
Drinking (and culinary) water in New Orleans 157
Durgin, Dr. S. H., on sanitary status of Boston 158
Dysentery, diagram, per cent of weekly reports of, by months in 1884 96
  weekly reports of, in 1884, compiled by months 94, 97-113
  importance of, as a cause of sickness in Michigan, each year 1881-4 117
  importance of, as a cause of sickness in several parts of Michigan, 1884 118-119

Earthquake in September, 1884 19
Edwards, Dr. Fitz Hugh, reports on inspection service 202, 203-205
Eklund, Dr. Frederick xxviii
Elder, Dr. E. S., on preparations in Indiana to resist cholera 156
Elsworth, Dr. A. M., on outbreak of diphtheria 244
Epidemic contingent fund, resolutions in regard to 167, 168
  act 230, laws of 1885 197
Erysipelas, diagram, per cent of weekly reports of, by months in 1884 138
  weekly reports of, in 1884, compiled by months 94, 97-113
  importance of, as a cause of sickness in Michigan each year 1881-4 117
  importance of, as a cause of sickness in several parts of Michigan, 1884 118-119
Examinations of plans for public buildings 117-182
Expenditures of State Board of Health, and on account of the Board .... xxvi-xxvii

Fever (*see Intermittent, Remittent, Typhoid, or Typho-malarial fever.*)
Filipow's experiments with ozone on men and dogs 8
Fitzgerald, Jas. J., meteorological observer, number of reports made 6
Fogs in Michigan in 1584 42-47
Folsom, Dr. E. G., on good health in Mt. Clemens 196
Frelinghuysen, Secretary, interest of in public health 169
Frosts, snow, birds, etc., in 1884 15-20
Funerals, public, in case of communicable diseases 248

Galveston (Texas), Dr. William Penny on sanitary condition of 165
George, Dr. Conrad, on outbreak of diphtheria 232
Germer, Dr. E. W., on sanitary status of Pennsylvania 162-163
Gibbs, James, on outbreak of diphtheria 247
Gilligan, J., meteorological observer, number of reports made 6
Glanders, history of 272-273
  in Michigan in 1885 273-276
  duty of board of health relative to 273-276
  in horses and sheep, state live stock sanitary commission has nothing to do with 174
Good health results from sanitary work 191-195
Gordon, Dr. G. G., number of meteorological reports made, etc 6, 52
  weekly reports of sickness made by 115
Gray, Henry R., on origin of small-pox epidemic in Montreal 197-198
Ground water, temperature of 21-23

Halos, meteors, auroras, etc 51, 52, 53
Harrington, Prof. M. W., number of meteorological reports made, etc 6
Hazlewood, Dr. Arthur, report on finances of the Board .... xxvi, xxx
  on "abdominal typhus" 280

PAGE.
Haslewood, Dr. Arthur, library book loaned to xxiv
  weekly reports of sickness 114
  term as member of Board, address, committees, etc. .... vii-viii, xxxiii
  action as committee on Mental Hygiene xxx
Health officers and physicians in Michigan 158-159
Health officers, compensation, duties of when not otherwise instructed 187
Health (state) inspection of travel 196-217
  expense of 212
Health in Michigan, August, 1885, sample bulletin ix
  July and August, 1885 191-192
Hearne, Dr. J. C., on sanitary status of Missouri 160
Hemenway, Dr. H. B., on sanitary work in Kalamazoo 192
Herrick, Dr. S. S., on imported rags 170
Hewitt, Dr. C. N., on sanitary status of Minnesota 159-160
Holmes, Howard M., number of meteorological reports made, etc. 6
Holt, Dr. A., on sanitary status of Cambridge 158
Horlbeck, Dr. H. B., on sanitary condition of Charleston 163
Hospitals in Michigan, law of 186-187
House-to-house inspection (sanitary survey) in Illinois 155
  in Indiana 156
  in New Orleans 157
  in St. Louis, Mo. 160
  in Cincinnati 162
  in Charleston, S. C. 163
Humidity of air in Michigan in 1884 and previous years..8-13, 25, 36-41, 120-127, 130-132, 134, 136-138, 140-141, 143-148.
Hurlbut, Dr. A. D., on outbreak of diphtheria 244

Illinois, Dr. John H. Rauch on sanitary status of, and sanitary survey in 155
Illuminating oil in Michigan, methods of testing, etc. 171-173
  State Board of Health on lowering test for .... xxxi, 171
Immigrants, inspection of at Port Huron and Detroit 201-205, 209-214
Indiana, Dr. E. S. Elder on preparations in against cholera 156
Inflammation of bowels, diagram, per cent of weekly reports of, by months in 1884 135
  weekly reports of, in 1884, compiled by months 94, 97-113
Inflammation of brain, diagram, per cent of weekly reports of, by months in 1884 135
  weekly reports of, in 1884, compiled by months 94, 97-113
Inflammation of kidney, diagram, per cent of weekly reports of, by months in 1884 133
  weekly reports of, in 1884, compiled by months 94, 97-113
  importance of, as a cause of sickness in Michigan, each year 1881-4 117
  importance of, as a cause of sickness in each of several parts of Michigan, 1884 118-119
Influenza, diagram, per cent of weekly reports of, by months in 1884 129
  in 1884 and previous years, reports compiled by months 94, 97-113, 128
  relations of, to climatic conditions, by months in 1884 .... 125, 131, 145
  importance of, as a cause of sickness in Michigan, each year 1881-4 117
  importance of, as a cause of sickness in each of several parts of Michigan, 1884 118-119
Inspection of travel, to guard against small-pox 196-217
  expense of 212
  at St. Clair, Mich. 213-214
  duty of national government to maintain 199-200
  need of a constant 215
Intermittent fever, diagram, per cent of weekly reports of, by months in 1884 142
  in 1884 and previous years, reports compiled by months 92, 94, 97-113, 139
  relations of, to climatic conditions, by months in 1884 .... 136, 140, 141, 146
  importance of, as a cause of sickness in Michigan, each year, 1881-4 117
  importance of, as a cause of sickness in each of several parts of Michigan, 1884 118-119
  third, as cause of sickness in Michigan in 1884 116

Jones, Dr. H. W., on lessened sickness in Houghton 192

Kedzie, Prof. R. C., number of meteorological reports made, etc. 6
Kellogg, Dr. John H., library books loaned to xxiii
  number of meteorological reports made, etc. 6
  resolution of, relative to salary of secretary xxix

PAGE.

- Kellogg, Dr. J. H., term as member of Board, address, committees, etc. .... vii-viii
- Kentucky, Dr. J. N. McCormack on preparations in against cholera 156
- Kimball, J. W., meteorological observer, number of reports made 6, 52

- La Rocque, Dr. A. B., on sanitary work in Montreal 167
- Law, Dr. W. J., on removal of body dead from small-pox 271
- Laws of Michigan, passed in 1885, relating to public health and safety 174
- Library of State Board of Health, gifts, purchases, etc. .... xi, xiii-xxiii
- Live-stock sanitary commission (State) has nothing to do with horses and sheep 174
- Lindsley, Dr. J. Berrien, on sanitary condition of Tennessee 164
- Lindsley, Dr. C. A., on sanitary status of Connecticut 155
- Local board of health work 153-154, 158-159, 163, 167, 168, 169
- Local boards of health, prevention of introduction of communicable diseases 184-189
  - expenses of, in preventing communicable diseases, to be paid by county xxx
  - power of, to isolate 249, 261
  - in Michigan 158-159
  - in New York 160
- Louisiana, Dr. S. R. Oliphant on sanitary status of 156-157
- Lumbering camps, action to prevent small-pox in 215-217
- Lyster, Dr. Henry F., library books loaned to xxiii
  - term as member of Board, address, committees, etc. .... vii-viii, xxxiii, xxxiv

- Mackenzie, Dr. Morell, on diphtheria arising *de novo* 233
- Manistique river, temperature of, and amount of water discharged 16-20
- Marine-hospital service, inspection of travel by in Michigan 201-205, 213-215
- Marvill, Lewis, number of meteorological reports made, etc. 6
- Maryland, Dr. C. W. Chancellor on sanitary status of 157
- Massachusetts, Dr. S. W. Abbott on sanitary status of 157-158
- McCall, Dr. H., on outbreak of diphtheria 234
- McCormack, Dr. J. N., on preparations in Kentucky against cholera 156
- McCulloch, Secretary, interest of in public health 169-170
- McFarland, Dr. J. T., on sanitary status of Savannah, Ga., and its quarantine 155
- Measles, diagram, per cent of weekly reports of, by months in 1884 133
  - in 1884 and previous years, reports compiled by months 92, 94, 97-113, 129
  - relations of, to climatic conditions, by months in 1884 .... 136, 140, 144, 146
  - importance of, as a cause of sickness in each of several parts of Michigan in 1884 118-119
  - annual average number of deaths from, in Michigan 183
  - in Michigan in 1885 280-281
  - source of contagium of 281
  - when most prevalent 281
  - measures taken to restrict 281
- Memphis (Tenn.), Dr. G. B. Thornton on sanitary condition of 165
- Mercer, Dr. A. Clifford, on outbreak of small-pox 267
  - on sanitary status of Syracuse 161-162
- Meteors, auroras, halos, etc. 51, 52, 53
- Meteorological statistics, uses of 1-4
- Meteorological observers for State Board of Health 6
- Meteorology and disease 2-4
- Meteorological causes of diseases, why so little is known 4-5
- Meteorological conditions and sickness, questions to be answered 3-4
- Meteorological conditions, relations of, to sickness 122-148
  - relations of, to total amount of sickness 147-148
  - conditions in Michigan in 1884 .... x, 1-86, 120-121
  - observers for 1884, latitude, longitude, altitude of stations, etc. 5, 6-7
  - characteristics of each month of 1884 8-13
  - at Agricultural College 13-15, 26, 27, 32, 33
  - frosts, snow, birds, etc. 15-20
  - earthquake 19
  - new instrument shelter at Lansing 21, 24, 25
  - measurements and temperature of ground water 21-23
  - temperature 8-35
  - humidity 8-13, 25, 36-41
  - fogs 42-47
  - cloudiness 8-13, 14-15, 48-50, 51, 52, 53

PAGE.

- Meteorological conditions, auroras, meteors, halos, etc. 51, 52, 53
  - rainfall 8-13, 14-15, 20, 54-56
  - ozone 2-3, 8-13, 56-68
  - velocity of wind 69, 70-72, 73
  - direction of wind 69, 72, 74-80
  - explanation of diagrams 81
  - atmospheric pressure 14-15, 82-86
  - diagrams 29, 34, 37, 41, 43, 48, 55, 64, 66, 70, 73, 74, 76, 85
- Michigan, Dr. Henry B. Baker on sanitary work in 158-159
- Mills, Dr. H. R., letters and reports from relative to inspection service 200, 202, 203, 210-212
- Minnesota, Dr. C. N. Hewitt on sanitary status of 159-160
- Missouri, Dr. J. C. Hearne on sanitary status of 160
- Mitchell, Dr. D. W., meteorological observer, number of reports made 6
- Mitchell, Dr. Charles, on sanitary condition of Nashville, Tenn. 164
- Montizambert, Dr. F., on quarantine in Canada 166-167
- Montreal, Dr. La Rocque on sanitary work in 167
- Mueller, J. E., meteorological observer, number of reports made 6
- Mulheron, Dr. J. J., reports on inspection service 202, 203 205, 211-212

- Nashville (Tenn.), Dr. Charles Mitchell on sanitary condition of 164
- National board of health, and national health work 153
  - need of 163
  - inspection service in 1882 209
- Neal, F. M., meteorological observer, number of reports made 6
- Neuralgia, diagram, per cent of weekly reports of, by months in 1884 133
  - in 1884 and previous years, reports compiled by months 92, 94, 97-113, 126, 128
  - relations of, to climatic conditions, by months in 1884 125, 132, 145
  - importance of, as a cause of sickness in Michigan, each year 1881-4 117
  - importance of, as a cause of sickness in each of several parts of Michigan in 1884 118-119
  - causes most sickness in Michigan in 1884 116
- New Orleans, sanitary survey, drinking-water, and privy-vaults in 157
- New York, Hon. Erastus Brooks on sanitary status of 160
- New Hampshire, Dr. Irving A. Watson on sanitary status of 160
- Nicholson, Dr. A. W., meteorological observer, number of reports made 6
- Norman, Marcus H., meteorological observer, number of reports made 6
- North Carolina, Dr. Thomas F. Wood on sanitary status of 162
- North, Dr. L. G., number of meteorological reports made, etc. 6
- Northup, Dr. M., reports on inspection service 202, 203, 210-212
- Notson, D. B., meteorological observer, number of reports made 6

- Oil inspectors (State) in council 171-173
- Oliphant, Dr. S. R., on sanitary status of Louisiana 156-157
- Ozone, Dr. Daniel Draper on importance of observations on 2
  - Dr. Andrew Smith on effects of 2
  - in Michigan in 1884 and previous years 8-13, 56-68, 120-122, 124-125, 127, 130-132, 134, 136-138, 141, 143-146, 148.
  - Dr. Henry Day's experiments 2-3
  - Filipow's experiments 3
  - observations on and yellow fever epidemics 3
  - test-paper, relative sensitiveness of new supply of 56-58

- Palmer, Dr. Geo. C., on plans for new infirmary at asylum for insane at Kalamazoo 180
  - number of meteorological reports made, etc. 6
- Parmelee, F. D., number of meteorological reports made, etc. 6
- Peckham, Dr. H. F., on diphtheria from Kalamazoo 236
- Penny, Dr. William, on sanitary condition of Galveston 165
- Pennsylvania, Dr. E. W. Germer on sanitary status of 162-163
- Permits for removal of sick persons or infected articles 188-190
- Perry, Dr. W. H., on small-pox at Girard 270
- Perry, M. H., number of meteorological reports made, etc. 6
- Phippen, Dr. S. S. C., on management of outbreak of scarlet fever 260
- Physicians in Michigan, coöperation of with health officers 158-159
  - list of, who make weekly reports of sickness 114-116
- Physiology, text-books on approved xxx, xxxii

PAGE.

Pierson, Rev. J., number of meteorological reports made, etc. ... 6
Pindell, L. M., meteorological observer, number of reports made ... 6
Pneumonia, diagram, per cent of weekly reports of, by months in 1884 ... 95
  in 1884 and previous years, reports compiled by months ... 92, 94, 97-113, 128
  relations of to climatic conditions, by months in 1884 ... 125-127, 145
  importance of, as a cause of sickness in Michigan, each year 1881-4 ... 117
  importance of, as a cause of sickness in each of several parts of Michigan, 1884 ... 118-119
  causation of, studied ... 5
  attack of, probably due to ozone ... 3
Poisonous cheese, Dr. Geo. M. Sternberg on ... 218-220
  Dr. V. C. Vaughan on ... 221-226
Poisonous sausage ... 225
Preston, Dr. W. M., on diphtheria taken from a cat ... 237
Prioleau, Dr. J. Ford, on sanitary status of South Carolina ... 163
Privy-vaults, prohibited in Green Bay, Wis. ... 165
  how managed in New Orleans ... 157
  Dr. Raymond's proposition in regard to treatment of ... 161, 168
  in Erie, Pa., disinfection of ... 163
  in Nashville, Tenn. ... 164
Puerperal fever, diagram, per cent of weekly reports of, by months in 1884 ... 133
  weekly reports of, in 1884, compiled by months ... 94, 97-113

Quarantine, law of, in Michigan ... 185-186
  in Canada, Dr. F. Montizambert on ... 166-167
  at Savannah, Ga. ... 155
  in Louisiana ... 156
  at Baltimore ... 157
  at Boston ... 158
  in South Carolina ... 163

Rags, imported, danger to public health of ... 169, 170
Rainfall in Michigan in 1884 and previous years ... 8-15, 20, 54-56, 121
Rauch, Dr. John H., on sanitary status of Illinois ... 155
Rauchfuss, E. J., number of meteorological reports made, etc. ... 6
Raymond, Dr. J. H., on sanitary condition of Brooklyn, and propositions submitted to conference of State boards of health ... 161, 168
Reeve, Dr. J. T., on sanitary work in Wisconsin ... 165
Reeves, Dr. James S., on outbreak of diphtheria ... 241
Reeves, Dr. J. E., on sanitary condition of Wheeling, W. Va. ... 165
Reform school at Lansing, examination of plans for ... 180, 181-182
Regulations relative to communicable diseases ... 189-190
Remittent fever, diagram, per cent of weekly reports of, by months in 1884 ... 142
  in 1884 and previous years, reports compiled by months ... 92, 94, 97-113, 139
  relations of, to climatic conditions, by months in 1884 ... 136, 140, 141, 146
  importance of, as a cause of sickness in Michigan, each year 1881-4 ... 116, 117
  importance of, as a cause of sickness in each of several parts of Michigan, 1884 ... 118-119
Rheumatism, diagram, per cent of weekly reports of, by months in 1884 ... 133
  in 1884 and previous years, reports compiled by months ... 94, 97-113, 128
  relations of, to climatic conditions, by months in 1884 ... 125, 132, 145
  importance of, as a cause of sickness in Michigan, each year 1881-4 ... 117
  importance of, as a cause of sickness in each of several parts of Michigan, 1884 ... 118-119
  second, as a cause of sickness in Michigan in 1884 ... 116
Richardson, Dr. E. S., meteorological observer, number of reports made ... 6
Richmond, Va., Dr. J. G. Cabell on sanitary condition of ... 165
Ross, Dr. E. J., on outbreak of typhoid fever ... 278
Rowland, Dr. C. W., on sanitary condition of Cincinnati ... 162
Rules for health inspectors of travel ... 207-209, 212-213

Sanitary survey:
  action of Michigan State board on ... xxxii
  in St. Louis, Mo. ... 160
  in Cincinnati ... 162
  in Charleston, S. C. ... 163
  in Illinois ... 155
  in Indiana ... 156

PAGE.
Sanitary survey, in New Orleans........ 157
Sanitary conventions........ vii
Sanitary condition of States and cities........ 155-167
Sanitary work, good health results from........ 191-195
Savannah, Ga., Dr. J. T. McFarland on sanitary status of, and its quarantine........ 155
Scarlet fever in Michigan in 1885........ 252-263
  in 1885 compared with 1884........ 252
  map of Michigan, showing distribution of, in 1885........ 253
  source of contagium in........ 254-258
  results of measures taken to restrict........ 258-260
  Owosso board of health on........ 260
  transgressions of regulations relative to, and results........ 260-261
  period of incubation of........ 261-262
  disease simulating........ 262-263
  distribution of documents relative to........ 254
  diagram, per cent of weekly reports of, by months in 1884........ 129
  in 1884 and previous years, reports compiled by months........ 94, 97-113, 128
  relations of, to climatic conditions, by months in 1884........ 125, 131, 145
  importance of, as a cause of sickness in each of several parts of Michigan in 1884........ 118-119
  prevention of introduction of........ 183-190
  annual average number of deaths from, in Michigan........ 183
  sickness from, in Michigan in 1884........ 183
Scavenging system in Charleston, S. C........ 163
Schaberg, Dr. H. H., on typhoid fever........ 278, 279
Shepard, Dr. C. W., number of meteorological reports made, etc........ 6
Shepard, Prof. J. H., analysis of water from Caro........ 238
Sherman, Dr. J. J., on detaining immigrants suspected of having small-pox........ 199
Shorts, Hon. P. P., bill to prevent introduction of cholera, etc., into Michigan........ 197
Sickness in Michigan, importance of different diseases as causes of........ 117-119
Sickness from average disease........ 146-147, 148
  diagram of........ 135
Signal Service, U. S. A., observers of in Michigan, and their reports to Michigan Board of Health........ 6
Small-pox, history of........ 263-264
  in Michigan in 1885........ 264-272
    at South Boardman, Kalkaska county........ 265, xxxvi
    at Alba, Antrim county........ 265
    at Battle Creek, Bellevue, and Cassapolis........ 265, 266-268, xxxvii
    at Grand Rapids........ 265, 268, xxxvi
    at South Haven, Van Buren county........ 265, 268-270, xxxvii
    at East Saginaw........ 265, 270
    at Girard, Branch county........ 265, 270
  measures taken to restrict spread of........ 265-266, 268, 269-270
  period of incubation of........ 267-268, 269
  removal of bodies dead from........ 271-272
  not found where reported........ 271
  distribution of pamphlets relative to........ 216-217, 272
  mistaken for chicken-pox........ 268
  when Michigan was free from........ 272
  action to prevent, in lumbering camps........ 215-217
  introduction of into United States........ 198-199
  diagram, per cent of weekly reports of, by months in 1884........ 129
  weekly reports of, in 1884, compiled by months........ 94, 97-113
  outbreaks of in Canada........ 166
  in Montreal, Canada........ 197-198
  in Wisconsin........ 199
  in North Carolina........ 162
  in Pennsylvania, from rag-shops........ 168
  37 outbreaks of stamped out in Detroit........ 206
  greatest danger of introduction of into Michigan........ 205
  necessity for inspection against........ 200, 205-206
  inspection service........ 196-217
  hospitals for........ 186-187
  annual average number of deaths from, in Michigan........ 183
  prevention of introduction of........ 183-190

PAGE.

- Smart, Dr. Charles, on "Quarantine and Sanitary Methods formulated by the National board of health in *Re* Asiatic cholera" 151-152
- Smith, Erwin F., on outbreak of typhoid fever in Ionia 278
- Smith, Dr. Wm. M., on need of constant inspection service 215
- Smith, Dr. Andrew, on effects of ozone in large quantities 3
- South Carolina, Dr. J. Ford Prioleau on sanitary status of 163
- Spiegelhalter, Dr. Joseph, on sanitary status of St. Louis 160
- State Board of Health, addresses of members, terms of office, committees, etc .... vii, xxviii
  - work of the office, fiscal year 1884 .... viii-xii
  - expenditures of, fiscal and calendar years 1885 .... xxvi-xxvii
  - expenditures on account of, fiscal years 1884 and 1885 xxvii
  - abstracts of proceedings of .... xxviii-xxxiv
  - abstracts of quarterly reports of work in office of .... xxxv-xxxvii
  - investigation of the office of .... xxxiii, xxxiv
  - action of in regard to cholera xxxiii
  - action of in regard to typhoid fever xxxiv
  - on removal of diphtheritic body 250
  - petitions President of U. S. relative to epidemic contingent fund 199
  - guarding Michigan from small-pox 206-213, 215-217
  - rules of, for inspection service against small pox 207-209, 212-213
  - resolutions of relative to doubtful cases of diphtheria 242
  - work of, in preparing to resist cholera 158-159
  - dissemination of information .... xi-xii
  - report of Secretary relative to property, fiscal year 1885 .... xiii-xxv
  - on lowering test for illuminating oil .... xxxi, 171
- State board of health of New York, work of, annual appropriation for 160-161
- State and local board of health work 153-154, 158-159, 167
- State health inspection of travel 196-217
  - expense of 212
- State house of correction at Ionia, examination of 175-176
- Statistics, meteorological, uses of 1-4
  - importance of health 87
- St. Louis, Dr. Joseph Spiegelhalter on sanitary status of 160
- Sternberg, Dr. Geo. M., experiments with poisonous cheese 218-220
  - on sulphur fumes as a disinfectant 246
- Steuart, Dr. James A., on sanitary status of Baltimore 157
- Sulphur, disinfection with 233, 243-246, 248-250, 258-260, 270, 272
- Sweet, Fred., meteorological observer, number of reports made 6
- Swift, C. E., meteorological observer, number of reports made 6
- Syracuse, Dr. A. Clifford Mercer on sanitary status of 161-162

- Temperature in Michigan in 1884 and previous years .... 8-35, 120-121, 124-127, 130-132, 134-138, 140-141, 144-148.
- Tennessee, Dr. J. Berrien Lindsley on sanitary condition of, and ability of to resist Asiatic cholera 164
- Testing illuminating oil in Michigan 171-173
- Thomason, Dr. H. D., on outbreak of diphtheria 238
- Thompson, Dr. A. A., diphtheria in institution for deaf and dumb at Flint 240
- Thornton, Dr. G. B., on sanitary condition of Memphis, Tenn 165
- Tonsilitis, diagram, per cent of weekly reports of, by months in 1884 129
  - in 1884 and previous years, reports compiled by months 94, 97-113, 128
  - relations of, to climatic conditions, by months in 1884 .... 125, 130, 145
  - importance of, as a cause of sickness in Michigan, each year 1881-4 117
  - importance of, as a cause of sickness in each of several parts of Michigan, 1884 118-119
- Toronto, Dr. William Canniff on sanitary work in 167
- Townshend, Dr. Smith, on sanitary condition of Washington, D. C 165
- Turner, Harry B., number of meteorological reports made, etc 6
- Tyler, Dr. C. V., report on examination of State house of correction at Ionia 175-176
  - term as member of board, address, committees, etc .... vii-viii, xxxiii
- Tyrotoxicon, or cheese-poison 221-226
- Typhoid fever, diagram, per cent of weekly reports of, by months in 1884 142
  - in 1884 and previous years, reports compiled by months 94, 97-113, 139
  - relations of, to climatic conditions, by months in 1884 .... 136, 140, 143, 146
  - in Michigan in 1885 276-280

Typhoid fever—(*Continued*). PAGE.
  time of year 1885 when most prevailed 276
  source of contagium of 277-279
  period of incubation of 279
  measures taken to restrict spread of 279
  kindred diseases, and 280
  outbreak attributed to polluted milk-supply 157
  action of State Board of Health relative to xxxiv
  causation of 5
  disinfectant for xii
  annual average number of deaths from, in Michigan 183
Typho-malarial fever, diagram, per cent of weekly reports of, by months in 1884 142
  in 1884 and previous years, reports compiled by months 94, 97-113, 139
  relations of, to climatic conditions, by months in 1884 .... 136, 140, 143, 146
  importance of, as a cause of sickness in several parts of Michigan, 1884 119
Typhus fever, mistake relative to 280

Vaccination, efforts to induce, in lumbering camps 215-217
  opposition to, in Montreal, Canada 198
  by health inspectors of travel 202, 210, 211, 212
  in Michigan in six months in 1885 217
Vapor inhaled and exhaled from air passages by one person in 24 hours (Troy oz) .... 124, 127, 130-132, 134, 136, 138, 141, 143-144, 148.
Vaughan, Dr. Victor C., on poisonous cheese 221-226
  verbal report on cheese-poisoning xxxi
  attends meeting of State Dairymen's Association xxxii
  library books loaned to xxiv
  term as member of Board, address, committees, etc .... vii-viii, xxxiii
Ventilation, in State house of correction at Ionia 176
  of Northern asylum for the insane 178-180
Vining, Dr. J. G., on small-pox at Alba 266

Wait, S. E., meteorological observer, number of reports made 6
Walcott, Dr. H. P., on imported rags 170
Washington, D. C., Dr. Smith Townshend on sanitary condition of 165
Water, drinking, in New Orleans, from cisterns almost exclusively 157
Watson, Dr. Irving A., on sanitary status of New Hampshire 160
  on duty of National government to establish inspection service 200
Weekly reports of diseases in Michigan in 1884, compilation and report .... viii, 87-151
  theory of 88
  diagrams, per cent of reports of each of 27 diseases 95, 129, 133, 135, 142
  change of plan in making 87-88
  present plan of making 89-90
  comparisons with previous years 94, 97-101, 106-111, 117, 123, 128, 147
  per cent of reports of each of 27 diseases, by years and months in 1884 .... 94, 100-111
  per cent of observers reporting each of 27 diseases, by years and months in 1884 97-99
  compensation for making 4
  list of physicians making 114-116
  bronchitis, pneumonia, etc., and coincident climatic conditions 122-148
  diseases causing most sickness 116-119
  letter to observers in regard to 89
  meteorological conditions and sickness from certain diseases 120-148
    bronchitis 122-125
    pneumonia and croup 125-127
    diphtheria and tonsilitis 130
    influenza and scarlet fever 131
    rheumatism and neuralgia 132
    pulmonary consumption 134
    diarrhœa and cholera infantum 136-138
    intermittent fever and remittent fever 140, 141
    typhoid and typho-malarial fever 140, 143
    measles and whooping-cough 140, 144
    summary 145-146
    meteorological stations used 120
    "cold weather" diseases 125-128

Weekly reports of diseases in Michigan in 1884—(*Continued*). PAGE.
  "warm weather" diseases 137
  geographical divisions of Michigan, for facilitating study of 93
  diseases reported in addition to those tabulated 149-150
Wells, surface, should be closed 161, 168
  power to close, in St. Louis, Mo. 160
Wheeling, W. Va., Dr. J. E. Reeves on sanitary condition of 165
Whelan, Dr. Bion, library books loaned to xxiv
Whooping-cough, diagram, per cent of weekly reports of, by months in 1884 133
  in 1884 and previous years, reports compiled by months 94, 97-113, 139
  relations of, to climatic conditions, by months in 1884 136, 140, 144, 146
  importance of, as a cause of sickness in Michigan, each year 1881-4 117
  importance of, as a cause of sickness in each of several parts of Michigan, 1884 118-119
  in Michigan in 1885 281-282
  source of contagium of 281-282
  when most prevalent 282
  measures taken to restrict 282
  annual average number of deaths from, in Michigan 183
Wight, Dr. O. W., letters relative to State health inspection of travel 200, 206, 215
Wind, velocity of in Michigan in 1884 and previous years 69, 70-72, 73, 120-122, 124-125, 127, 130-132, 134, 136-138, 141, 143-146, 148.
  direction of in Michigan in 1884 and previous years 69, 72, 74, 80
Wisconsin, Dr. J. T. Reeve on sanitary work in 165
Wood, Dr. Thomas F., on sanitary status of North Carolina 162
Wood, Dr. David H., on outbreak of diphtheria 238
Yates, Dr. Albert, number of meteorological reports made, etc 6
Yellow fever, epidemics and ozone observations 3

ERRATA.

Pages 83 and 86, in headings of the tables, for *stations arranged in order by latitude, those farthest north first*, read *arranged in order by geographical divisions.*

Page 99, Small-pox in the month of October, 1884, should read *0* instead of *9*.

Page 128, Influenza in Aug., 1884, should read *30* instead of *47*.

Page 129, line for Influenza in diagram should cross the line for August at its intersection with the line opposite 30.

Page 131, line for Influenza in August should be placed below the average line; in the first column *47* should be *30*; and the letter *a* should appear in the third and last figure columns instead of the columns in which they are.

Page 145, Aug. in second column should be placed in the third column; and the figures for Influenza should be *5, 8, 9, 11, 10, 8, 10, 9, 3, 10, 10*.

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